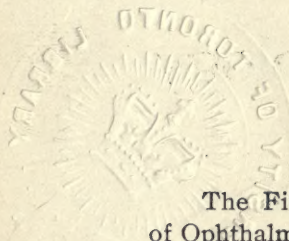


TRANSACTIONS
OF THE
FOURTEENTH ANNUAL MEETING
OF THE
American
Academy of Ophthalmology
and Oto-Laryngology

OPHTHALMOLOGICAL SECTION

HELD AT
NEW YORK
OCTOBER 4, 5, 6, 1909

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The Fifteenth Annual Meeting of the American Academy
of Ophthalmology and Oto-Laryngology will be held in Cincin-
nati, Ohio, September 19, 20, 21, 1910.

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PRESIDENT'S ADDRESS

OTTO J. STEIN, M.D.
CHICAGO, ILL.

FELLOW MEMBERS OF THE ACADEMY, LADIES AND GENTLEMEN :

The patron of good fortune certainly favored me when I became the choice of this Academy for President of its Fourteenth Annual Session and I desire, first of all, to acknowledge the extreme honor that lay in your hands to bestow, in entrusting me with the responsibility of this office. To have received the confidence of one's confrères so as to be singled out as the one to preside over the deliberations of this honorable gathering is surely an honor and a pleasure.

As it is customary on such an occasion as this for the chief executive to present an address, I have chosen and, with your kind permission, desire to offer in lieu of the customary thesis, some informal remarks upon a few observations made during my ten years as a member of this Academy. In presenting these personal views concerning our Society I would not have you think for an instant that I desire to formulate plans or to dictate a policy for you to follow; but, my incentive was chiefly born from questions that repeatedly came up in the execution of the routine work of the Society during the eight years that I was treasurer. What I now offer are mere suggestions for the good of the order.

The office of President is made up of a mixture of equal parts of work and responsibility, tintured with just a sufficient sense of dignity to make it a most agreeable and acceptable position. As I look back and recall the work done by my predecessors in office during the early struggles and the many obstacles that all young and growing organizations meet with, I am alive to the determination and optimism displayed by these men in planning and constructing such a magnificent organization as we have today. Each one of these standard bearers has carried the colors a great distance to the front and there planted them as an evidence of progression and accomplishment; but, the enjoyment of this advancement belongs to us all. The love for our work; the craving for a wider and deeper understanding of all that appertains to it; the pleasure of hearing one another's opinions;

of meeting and grasping the hand or patting the shoulder of the old and the new member, all this is what has made our progression so phenomenal.

You know this Society is unique in several respects; first, it brings together under one banner eye, ear, nose and throat workers; second, it encourages the membership of both the young and the advanced specialist; third, it is thoroughly democratic. We have an organization so democratic in its make-up that it has been powerful in the good influence it has cast upon its units, far-reaching in its teachings, and broadening and elevating in its fellowship. The gentlemen that were active in the reorganization of this Society recognized a truth that has been overlooked or discredited by other organizations, namely: that amongst the flotsam and jetsam of this great international American medical profession of something like two hundred thousand men and women, there are many who desire to progress, who have by nature ability, who have good training and are imbued with the desire to do right, but, owing to certain circumstances, they find it difficult to receive that encouragement, inspiration, or that opportunity to further their progress which they ought to feel and receive at all times from their more fortunate confreres. To them this Society extends the hand of welcome. To them we offer every encouragement to participate in its regular proceedings. To them we are giving aid in their desire to progress by receiving the best they have in them. To them we are a stimulus because of our ability to do things and because of our enthusiasm. To them we impart the wisdom of our long, wide and varied experiences. To them a society of this kind is similar to a post-graduate training. You know, as I do, that truth can not be confined to a narrow body of men. Such a thought is a reproach upon our national sense of fairness and fraternal spirit. Organizations of this kind do not make more specialists like the medical schools, but better ones. But democratic as we are, careful discrimination in the selection of members should be jealously fostered in order to insure the durability and stability of our institution; this discrimination should be directed towards the morality and honesty of the applicant rather than towards his achievements. Time and his association will develop the latter.

The fact that this Society associates under its organization the eye with the ear, nose and throat specialties has been seized upon by a few ultra orthodox brethren as something reprehensible and a subject for criticism. But I would remind those of such an opinion that we must not study sentiment and individual preju-

dice in place of conditions. The man who sees only the hole in the doughnut is sure to miss a good thing. The fact that we divide our work into various branches according to the part or parts of the body affected means nothing to Nature, which makes no such distinction. And, although there exists an intimacy between the various organs and tissues of the whole body, needless to say that neighboring organs are of necessity more subject to influence one another than otherwise, and that is why the eye, the ear, the nose and throat, with their neighboring adnexa and the brain, are of so great an importance to us who profess to follow the medical and surgical specialty of any of these organs. The intimacy between adjacent organs has let the specialist into the study and investigation of contiguous parts, so to speak, and in this manner has been developed the new knowledge of bronchoscopy, esophagoscopy and gastroscopy; the eye developments in the presence of certain nasal sinus affections and the brain changes in the presence of certain ear affections. Personally, I do no eye work, but aim to keep informed upon such matters that we have learned, relate to one another in these four organs, and I feel that he who has the benefit of a thorough understanding of all these organs is in a better position and one who should receive everyone's attention and respect. In large medical centers, this association of knowledge is not so vital as in the smaller communities, because there we always have at hand those who have the superior knowledge, which cannot be so easily procured in the smaller places. Hence, it becomes an absolute necessity for the specialist in small communities to fortify himself with a thorough understanding of the subjects appertaining to all the four organs. This is one reason why the Academy in its Articles of Constitution at the very outset offers encouragement to the large army of medical men and women particularly interested in all of the four branches. It is a pleasure for me to remark here that out of the material composing our membership of ten years ago there has developed some of the brightest minds, the greatest work and the most successful careers of any of our entire profession.

Now as to the possibilities of our Society. It has occurred to me that these possibilities might be greatly extended; for, as it is now, much, if not most, of the substance expressed from the meaty essays presented at each annual session reaches only the eyes and ears of a few, whereas the character of many of these essays warrants their wider hearing and perusal. An organization like ours, with its six hundred members, who speak authori-

tatively on their chosen subjects, should be a factor of importance to the entire world. Its influence should be felt by the whole business world employing hundreds of thousands of people that require the very best of hygienic and sanitary surroundings to keep them free from the dangers and complexities that beset the colonization of labor as employed in these modern days. The merchant and manufacturer are interested, because it teaches them how to ventilate, light and heat their work rooms; and, because in the manufacture of his lead and his tobacco, he knows that blindness often results, yet its dangers can be lessened or averted by his better understanding; and in this manner his responsibilities under the new legislative enactment of Employers' Liability are lessened. The railroads are interested, because the excellency and success of their roads depends upon the eyes and ears of their employees. The great insurance companies must be vitally interested, because the public health means their successful perpetuation. They already recognize the seriousness of suppurative ear affections on longevity and they will soon learn of the equally potent influence that certain suppurative nasal sinus diseases have upon the health and life of the individual. The employee would learn to distrust alcohol in its many forms, such as wood alcohol or Columbia spirits, bay rum, Jamaica ginger and many of the patent medicines, because of the danger of blindness from their inordinate use.

We of this Society, I believe, should be men and women of large outlook, who will not shirk from the consideration of great, broad and far-reaching problems. Our horizon of conception and understanding must not be limited to things purely medical, but our thoughts should be used and our voices raised for the mutual enlightenment and development of all mankind. We have but to manifest an active interest in matters that appertain to the ethical, business and social side of medicine and I predict for our specialty a much greater advancement,—for the public a greater enlightenment and for us individually a greater satisfaction. Workers in social, industrial and economic reforms would familiarize themselves with the opinions of medical men who are constantly seeing the baneful influences of the prostitution of physiological laws. It has already been the custom of this Society to discuss some of the economic problems that interest the medical and lay world, but sufficient importance has not been given to the great value of these contributions. And, if some means are not secured to create a larger audience for these papers, a great cause is being neglected, and one of the great func-

tions of this organization neglected to the detriment of the whole world. Such subjects as Ophthalmia Neonatorum, Restriction of Noises, the Mitigation of Street Dust, the Clarification of the Atmosphere, the Examination of School Children for Defective Vision, Hearing and Nasal Breathing, the Optometry Law. All these and many more should repeatedly come before this body for discussion and recommendations emanate from this Society pointing out the remedy. It is the voice of just such large organizations as this that our state and federal legislators must hear before they are sufficiently aroused to enact the laws necessary for the correction of these evils. If we are to reach the ears of the public on subjects of vital interest to us both, then we must voice our sentiments in no hesitating manner. Already we have been outdistanced through organized efforts of opponents to medical progress. The anti-vaccinationists, the anti-vivisectionists and the Christian Scientists are but examples of the effort made by organization to prejudice the public mind and lead them from the truth. But, one cannot blame the public for this. It is because the public knows no better. Medical men have not acquainted them with the facts. An amalgamation of medical interests, as this Society represents, can become a power in educating the public in affairs material to their good health and welfare. The public is interested and wants to know about medical affairs, if we will only take them into our confidence. But how, you ask? The secular press is the very best avenue, because most people read the public press and nothing else. Only, it would have to be done under careful and honest censorship, eliminating sensationalism and avoiding personalities. Another way might be through the bulletins and pamphlets issued by our state and municipal health boards, which are now so universally distributed to the public. The idea is already carried out in a sporadic and very limited way by the public lectures held weekly by medical men. I am aware that this is not a new idea, having received the attention of several progressive men in the past year or two. But, I take the opportunity to encourage the thought and to this end I suggest the creation of a committee for the purpose of recommending ways and means to disseminate such reports and opinions of this Society that might be of interest to the general public.

Events in the history of our Society are so crowding themselves in recent times by almost miraculous advances and great numbers that it seems timely to pause once and again and take note of these kaleidoscopic changes; to bestow a word of praise,

an acknowledgement of appreciation, an expression of commendation upon the work hewn out by the pioneers who have blazed the way and upon the army of workers who have followed along these surveyed ways, developing, cultivating, elaborating, simplifying and perfecting. Some of our greatest inspirations and ideals are born through the study of Biography and so it would seem to me that we might bestow a great benefit upon the younger men and women in this work by constantly keeping before them the recital of the names and deeds of the history workers of our specialty. In this sense I offer the suggestion that we create a place in our chronicles devoted to the memory of our departed leaders, so that in glancing through a volume of the Transactions there will ever appear to the reader's eye the name, the time and the occasion of those who have helped to make our specialty.

In the preparation of the annual program, it should be the aim of the Program Committee, as far as possible, to select and arrange the subjects of the essays for presentation so as to interest the whole membership most of the time, reserving the strictly technical papers for discussion in separate sections. The success of this plan was beautifully demonstrated at our recent meeting in Cleveland. And, it has been the endeavor of the Committee for this meeting to arrange the various subjects for discussion in such a way as to interest all of you most of the time. It was with this idea in mind that we undertook the creation of a series of papers, prepared in such a manner as to present the various angles and sides of the relationship that our respective specialties, the eye, ear, nose and throat, bear to society, to hygiene and to economics. The cordial response received from various members was both encouraging and gratifying and I desire at this time to tender my sincere appreciation to the different gentlemen who so kindly and promptly consented to present to you this morning the different parts of the Symposium entitled "The Social, Hygienic and Economic Aspect of the Eye, Ear, Nose and Throat."

Now I come to a vitally important subject and, in mentioning it, I appreciate its gravity. I refer to the necessity of an early revision of our Constitution and By-Laws. The adoption of the present Constitution and By-Laws, seven years ago, has been the means of building and perfecting the largest organization of its kind that I am familiar with. But quite a few riders have since been attached and at this meeting there will be several more presented for your consideration and there is occasion for the adop-

tion of others. Now, in order not to have a patch-work of rules for the government and to bring it up to the growth and standing that this Society has assumed, I would suggest that in a revised edition attention be paid to the following subjects: The question as to the advisability of continuing the Member and Fellow classification is of sufficient seriousness to receive our attention. You will more fully appreciate my concern in this particular, when informed that I was one of three who suggested and discussed the advisability of urging the adoption of this idea. We felt at the time that there was a great multitude of men and women in this work that needed a good strong society, but, owing to their youth, or the fact that they did border line work precluded their entrance into other desirable societies and in order to admit such candidates, at the same time stimulate their progression and also, in order to recognize the riper experience and ability of the advanced worker, this classification was adopted as meeting the wants of all. I believe that the adoption of this plan has contributed much towards the making of this Society, but I cannot help feeling that it is the one and only part of our Constitution that reflects upon the source of our greatest pride, namely, our thoroughly democratic spirit. In keeping with this spirit and in order not to allow the opportunity for any reflection upon the same, the question, as I have stated, comes up whether we had not best drop the word "Fellow" and all become plain members at five dollars per year. Again, a specific provision should be secured in our By-Laws relative to the ethically wayward, for which, at the present time, no provision is made. Again, the advisability of adding a new office, that of Historian or Archivist, who would bring before us at each meeting a paper on the résumé of the year's progress in our particular work. Again, a provision should be made in the By-Laws setting forth more specifically the rules on essays. For instance, it occasionally happens that an author presents a voluminous piece of work, much beyond the allowed time limit of twenty minutes, and for which a request is made for its publication in full in the Transactions. Again a valuable piece of work has been prepared for presentation and through sickness or some similar inability to be present the author is unable to read it in person, although he sends his paper with the request that it be read. It would be wise to have some provision in our By-Laws whereby such a paper of value could be heard and enjoyed and perhaps thus avert the disappointment of some member who might have been particularly attracted to the meeting by the title of such a paper. Another matter for consideration should be the

time of meeting. Some dissatisfaction occasionally arises owing to the fact that the date of meeting varies some. Some seem to favor meeting during the summer months, while others prefer the meeting held after the vacation time. You will remember that the meetings were originally held in April, but, owing to nearness of the meetings of the American Laryngological Association, American Otological Society, American Ophthalmological Society, American Otological, Laryngological and Rhinological Society and the American Medical Association, which are held early in the year, the time was changed to the late summer or early fall. By selecting some definite date members might readily compute their arrangements to attend with greater certainty.

Before concluding my remarks, I desire to say that it was the earnest wish of this administration to prepare for your enjoyment and profit a most royal feast, both literary and social, and with this purpose in view extended invitations to several highly eminent men to meet with us and present the fruits of their labor and experience. And, I feel that this Society is to be congratulated for the warm and hearty manner in which these invitations were received and accepted, and, were it not for an entirely unexpected illness occurring at the last moment, there would have been no occasion to announce the great disappointment I know we all feel in being deprived of the honor and pleasure of the presence here today of Prof. Onodi and Dr. Sendziak. But I am delighted to add that we are to be congratulated in having with us as our guest Dr. J. Santos Fernandez of Havana, whose presence here adds luster to the occasion. On behalf of this Society I welcome Dr. Fernandez to our country and to this meeting and thank him most heartily for coming and meeting with us.

And now, in inviting your attention to the scientific and social program of this meeting, I desire to voice my warmest appreciation for the very loyal support given by various members during the past year, and in particular I feel deeply indebted to our worthy Council, our hard-worked Secretary and the Committee of Arrangements here in New York City, with their Chairman, Dr. Percy Fridenberg, working like a human dynamo, all of whom have contributed much toward the making of this notable gathering.

ADDRESSES

PROGRESS OF LARYNGOLOGY AND RHINOLOGY SINCE THE INVENTION OF THE LARYNGO- SCOPE, WITH SPECIAL REFERENCE TO THE PARTICIPATION OF AMERICA IN THIS PROGRESS.

BY JOHN SENDZIAK,
WARSAW (POLAND).

MR. PRESIDENT AND MEMBERS OF THE AMERICAN ACADEMY OF
OPHTHALMOLOGY AND OTO-LARYNGOLOGY:

It is first my pleasant duty to express to you my sincerest thanks for the great honor of inviting me to come to America and deliver an address at this meeting.

I have accepted this invitation with greater willingness in that it gives me the opportunity, as a representative of the Polish nation, of expressing my gratefulness to your great country which has so generously and appreciatingly recognized the merits of my countrymen, Kosciuzko and Pulaski, who joined in the fight for its freedom. And I feel thankful too for your country's hospitality and generosity towards my people who are forced by grievous conditions to seek in another hemisphere means of earning their daily bread.

Before passing to the subject proper of my address, the development of laryngology and rhinology since the invention of the laryngoscope, with special reference to the participation of America in this development, allow me to honor the memory of the distinguished representatives of our specialty in America who have been called away by the common foe from their great activity. I shall mention here only the names of Elsberg, a pioneer in American laryngology; O'Dwyer, Morgan, Hooper, Jarvis, Thorner, Mulhall, Lincoln, Daly, Asch, Dickerman, Glasgow, Shadle, all of whom have achieved a permanent place in laryngologic literature.

Let me, also, as a representative of European laryngo-rhinology, salute the great body of our fraternity in America, among the most eminent of whom are those who are here assembled.

In preparing the paper which was written for the fifty-year jubilee of the invention of the laryngoscope, and published in the

Centralblatt f. Laryngologie last year, upon the development of laryngology and rhinology in the individual countries, I was struck by the uncommon strength and number of the papers written by our American colleagues.

It is sufficient to state that one-third of all the literature on laryngology and oto-laryngology comes from America.

It is worthy of note that here in New York where this meeting takes place, the first general laryngological society was founded in 1873, more than thirty-five years ago. The first German society, however, was organized in 1877, four years later, as the oto-laryngological section of the Association of German Naturalists and Physicians. In other countries, such societies were founded much later.

In general, oto-laryngology and ophthalmology, often associated together, did not attain the recognition in any European country as in America.

Already in 1861, soon after the invention of the laryngoscope, the great Elsberg, who died alas too soon, was teaching his specialty in the New York University. Since that time special chairs of oto-laryngology have been established in all the American universities, more than one hundred in number. In this regard and with respect to special hospitals devoted to oto-laryngology and ophthalmology, old Europe remains considerably behind her younger sister.

There are quite a number of special oto-laryngologic journals (six) in America, about one-sixth of all publications of this character. It is worthy of note that the *Archives of Laryngology* was established in New York in 1880, nearly thirty years ago. It was unfortunately only continued for three years. Only two European journals were founded before this, the *Monatsschrift für Ohrenheilkunde, etc.*, in Germany in 1867, and the *Annales des Maladies des Oreilles, etc.*, in France in 1875.

The tremendous development of American laryngo-rhinology is strikingly shown in the immense number of papers published, 13,000, more than one-fourth of those in the literature of laryngo-rhinology during the past twenty-five years. In this respect America occupies the first place among the nations of the world.

Of these, about 1,300 of the American publications are general in character; there are fifteen manuals of laryngology, rhinology and otology, about one-sixth of the total of such publications.

Several of those have passed through a number of editions, testifying to their value, for instance, Solis Cohen, Seiler, Sajous, Bosworth, Coakley, Braden Kyle (four editions of this excellent

treatise have been published.) One of the first treatises on diseases of the upper-air passages was published in America, that of Horace Green, in 1840, in prelaryngoscope days. The first was published in Germany in 1829, by Albert of Bonn. One of the best histories of laryngology came from the pen of your very distinguished fellow-citizen, Jonathan Wright.

The exceedingly important relation between laryngo-rhinology and general medicine, to which attention was called first by Loeri of Buda-Pesth in 1885, and later by Friedrich of Leipzig, and Semon of London, has been the subject of many valuable papers by Americans, viz., Goodale, Goldsmith, Freudenthal, Johnston, Mayer, Simpson, Harris, Stucky, Levy, Stein, Bryant and many others who have discussed the relation of diseases of ear, nose and throat to nervous and mental diseases, rheumatism, gout, diabetes mellitus, lues, tuberculosis and diseases of the digestive and circulatory systems. All but Simpson came to the conclusion that a causal relation undoubtedly exists between them.

The relation between diseases of the nose, especially those of the accessory sinuses, and the eye, to which attention was called in Europe by Ziem, Jonas, Onodi, etc., has been, of late, carefully studied by American specialists: Pierce, Cutler, Griffin, Holmes, Hoople, Murphy, Johnston, Halstead, Pooley, Hastings, Posey, Brawley and Loeb (anatomic research). Flatau and Gutzman in Germany have written many special articles on the voice and its culture and speech defects; in America, Hudson Makuen, Scripture, Miller, Solis Cohen, Holbrook Curtis and many others.

In the realm of anatomy, histology, pathologic anatomy, bacteriology and physiology of the upper-air tract, in which Zuckerkandl, Onodi and Hajek in Austria, B. Fraenkel, Kuttner, Heymann and Klemperer in Germany, Semon and Horsley in England, Dmochowski in Poland and Groeckaert in Holland have distinguished themselves, I may mention the very valuable papers, in America, of Loeb, Ingersoll, Bryson, Delavan, Holmes, Wood, Ballenger, Jonathan Wright, Pierce, Hooper and many others.

I pass on to the methods of examination of the upper-air passages. As an auxiliary to laryngoscopy, which was introduced more than fifty years ago by Garcia, Tuerck and Czermak, there have been added a number of methods, especially autoscapy by Kirstein of Germany, high and low tracheoscopy (this latter was first applied by my compatriot, Prof. Pieniazek of Cracow), bronchoscopy, the famous work of Killian of Freiburg, esophagoscopy (Stoerk in Austria, Mikulicz in Poland, Hacker and Rosenheim in Germany), transillumination of the accessory nasal cavities

(Vohsen of Frankfurt on the Main and my compatriot, Heryng) and radioscopy, the application of the Roentgen rays, minutely described at the first international congress of laryngology at Vienna by Burger of Amsterdam, Ferreri of Rome, Gradenigo of Turin and Killian of Freiburg.

All of these methods have been described in detail in America. Above all, Chevalier Jackson, of Pittsburg, who wrote an excellent monograph, the first in English, on tracheo-bronchoscopy, esophagoscopy, and gastroscopy, then Halstead, Chisholm, etc. French brought photography into the service of laryngology, Beck stereoscopy and stereopticon color photography and Bleyer the phonograph.

Levy made studies of the newer diagnostic methods, such as tests for tuberculosis (ophthalmoreaction of Calmette) and the Wasserman reaction for syphilis (Smithies).

Passing on to the remedies and therapeutic methods which have enriched our field since the advent of laryngoscopy, partly collected in the excellent pharmacopea of Lefferts (2d edition, 1885), I must in the first place cite cocain (eucain, alypin, etc.), introduced in 1884 to laryngology by Jellinek of Vienna. The introduction of the specific serum simultaneously by Roux of Paris and Behring of Berlin was of the greatest importance in the treatment of diphtheria, as well as the use of intubation in laryngeal diphtheria, which was the contribution of the eminent American physician, O'Dwyer.

Phototherapy (sunlight, ultra violet rays, Finsen's method), Roentgen rays and radium, the latest discovered by my compatriot, Sklodowska (Currie) of Paris, have been utilized for different diseases of the upper-air passages, especially lupus and malignant disease; likewise electricity, galvanocautery and electrolysis have been utilized in Europe (Gradenigo, Ferreri) and in America (Freudenthal, Scheppegegrell and many others).

Solis Cohen has written an excellent monograph on inhalations, the principal exponent of which in Europe is Heryng of Warsaw.

Other methods which have been tried in minute detail in America are paraffin injections, first applied by Gersuny of Vienna, for malformations of the nose (*nez de mouton*, etc.) and Bier's hyperemia, regarding which there is still difference of opinion. The former is sometimes dangerous (cases of sudden blindness, Semon, Davis, Smith).

Among the most important remedies applied with more or less success in diseases of the upper-air passages, I must mention

orthoform, introduced as a therapeutic agent for laryngeal tuberculosis by the distinguished American specialist, Freudenthal, and adrenalin for making nasal operations almost bloodless.

Many of the new or modified instruments for the diagnosis and treatment of diseases of the upper-air passages were invented by Americans: Jarvis (snare), Bosworth (saw), Richards, Curtis, Allen, Pierce, Stein, Beck, Ballenger, Freer, etc.

Rhinology, a younger sister of laryngology, has shown a remarkable development during the past twenty-five years, especially with reference to the accessory sinuses. The literature comprehends more than 11,000 papers or publications, about one-fourth of the entire laryngo-rhinologic literature, of which 4,500, or 40 per cent, are American. The investigations of Thomson and Hewlett of England, of Wurtz and Lermoyez of France, and Schousbone of Denmark, showed that the healthy nasal secretions are free from bacteria and possess bactericidal properties. As to the cause of atrophic rhinitis some authors in America, such as Rice, regard it as due to a special organism (Loewenberg-Abel diplococcus), while others, for instance, the well-known specialist, Kyle, do not.

Beck, among others in America, opposes Grüngald's theory of the simultaneous causal connection between atrophic rhinitis and affections of the accessory nasal cavities. As to the treatment of this obstinate disease most of the writers in America, for instance, Richards, are pessimistic. On the contrary, Brown of Trieste, and Laker of Graz consider vibratory massage as most efficacious (Weightman in America), but the method has not come into general use. The same thing applies to electrolysis by Belgian authors (Cheval, etc.) and antidiphtheritic serum by Italian writers (Belfanti, Della Vedova, etc.).

Hypertrophies of the turbinates are best treated with galvanocautery, less so by resection. Stucky in America is not favorable to operations on the middle turbinate, a view with which I concur.

Deviations of the nasal septum have of late been made the subject of many papers in America, by Jackson, Ballenger, Swain, Rhodes, Hurd, Sheedy, etc. Killian in Europe and Freer in America almost simultaneously devised the submucous resection operation, now generally adopted.

Braden Kyle proposes the V-shaped resection and Price Brown the H-shaped (this latter is simply a modification of Asch's well-known method). Beck has recently written a valuable paper

on the surgery of the external deformities of the nose. Freudenthal has, among others in America, contributed a paper on bleeding from the nose, Gleitsmann, Mosher and Thrasher on tuberculosis, Donelan, Lincoln and John Mackenzie on syphilis and Jonathan Wright, Cobb, Levy, Price Brown, Wishart, on malignant neoplasms.

As to the so-called reflex neuroses of nasal origin (asthma, hay fever, headaches, cough, enuresis nocturna, epilepsy, etc.) it should be stated that since Hack's publications appeared, the boundless enthusiasm has given way to a more rational opinion to the effect that there is undoubtedly a causal relation which, however, is by no means so frequent as certain writers, such as Jonas in Germany, still maintain; at that, sometimes, but not so very frequently, the removal of the cause by appropriate surgical operation on the nose is followed by the disappearance of the nervous symptoms. Wendell Phillips of New York, on the contrary, is somewhat skeptical of this point.

It should be mentioned that more recent publications suggest new methods of treatment of asthma by bronchoscopy (Nowotny from the clinic of Pieniazek in Cracow), and of hay fever by serum (Loeb), by submucous injections of alcohol (our esteemed President Stein) and by immunization (Curtis).

In the main, it should be stated that in recent literature the abuse of nasal operations may be noted, to which Semon justly drew attention in Europe and John Mackenzie in America. This pertains especially to the use of the galvanocautery, the resection of the turbinates and operations on the nasal septum.

Above all, the development of our knowledge of the accessory nasal cavities and their pathologic process has been marvellous during the past twenty-five years. Beginning with Ziem's clinical investigations on the antrum of Highmore and the anatomic research of Zuckerkandl, the subject has been carried forward by such men as Killian, Grünwald, Gerber and Uffenorde of Germany, Hajek and Onodi of Austria and Oppikofer of Basel, all authors of the newest and most exhaustive monographs on the subject.

In America there have been many valuable papers written on the subject, anatomic and physiologic by Loeb, Chisholm and Ingersoll, clinical by Lothrop, Coffin, Myles, Coakley, Cobb, Richards, Ingals, Jackson, Curtis, Roe, Holmes, Theisen, Ballenger, Kyle, de Roaldes, Johnston (empyema) and by Gleitsman (tuberculosis).

In general, it may be stated that skiagraphy occupies the final position in the transillumination of the accessory cavities for diagnostic purposes.

So far as the nasopharynx is concerned the greatest attention during the past twenty-five years has been devoted to the so-called adenoid vegetations, although the pathologic condition had been described in 1868, more than forty years ago, by the Danish otologist, Wilhelm Meyer, in honor of whom the laryngologic world erected a monument in his native town, Copenhagen.

One of the best monographs on the subject was written by Gradenigo of Turin. Many valuable papers have been published in America, among others, by Braden Kyle, Paz, de Roaldes, Legurd, Richards, as well as Freer, who proposes the operation through the nose, an old method suggested by the father of adenoid vegetations, now generally abandoned in Europe for Gottstein's or Beckmann's curettes, applied through the mouth, without general narcosis (except in England).

Roy has written a paper on Tornwaldt's disease, bursitis nasopharyngealis, and Makuen on nasopharyngeal tumors.

The oral and pharyngeal cavities have been made the subject of many papers during the past twenty-five years—about 13,000, of which 3,500, more than one-fourth, have come from America. Among these are the anatomic as well as physiologic papers of the distinguished American specialists, Wood, Pierce, Ballenger.

The nature of the so-called follicular angina and its relation to diphtheria has been the subject for many papers. Most of the writers (B. Fraenkel, myself and others) on bacteriologic grounds regard it as an independent pathologic process having nothing in common with true diphtheria, staphylococci, streptococci and pseudodiphtheritic bacilli being constantly found in follicular angina. De Roaldes and Ward have written, among others, on this point.

An enormous literature exists upon diphtheria and its treatment with the Roux-Behring antidiphtheritic serum, both in Europe and America, about 6,000 papers, of which 1,500, one-fourth, are from America.

The results are generally favorable—for instance, Martin in America reports only 9.7 per cent of deaths. The treatment of croup by intubation, now adopted in Europe, is of everlasting credit to the American physician, O'Dwyer.

Cobb, Fitzwilliams, Holmes and others have written on tonsillar, peritonsillar and retropharyngeal abscess. Chevalier Jackson advises tonsillectomy instead of tonsillotomy, for hypertro-

phied faucial tonsils, an opinion with which Richards concurs. It is, however, difficult to agree with this view.

Hypertrophy of the lingual tonsil, to which attention has been drawn in Europe only in more recent times (Michael's of Hamburg excellent monograph), has been discussed by many writers in America, Gleitsmann, Oppenheimer.

Vincent's angina, but lately described as due to the bacillus fusiformis (Plaut-Vincent), has been described among others by Buhlig in America, but the pathologic process itself requires still further investigation. The same requirement exists for the pneumococcus infection of the throat described recently by Semon.

Bryson Delavan, Newcomb and Chevalier Jackson in America have written on tonsillar and peritonsillar bleeding.

Miles, Gibb, Mayer, have written on diseases of the salivary ducts and glands and Stein and Shoemaker on leucoplakia buccalis.

Many of our American colleagues (Richardson, Brown Kelly, Braden Kyle and Wood) have written on mycosis tonsillaris benigna, a disease described under this term for the first time by B. Fraenkel of Berlin in 1873, and afterwards by Heryng of Warsaw (mycosis leptothricia pharyngis). They all adhere to Siebenmann's theory that it is not a proper mycosis, but a hyperkeratosis of the epithelium, the leptothrix buccalis being only accidental. With reference to the so-called black tongue (lingua nigra) which some authors, especially in Poland, Cionglinski, Hewelke and myself, as well as Schmiegelow of Copenhagen, hold to be mycosis (mucor niger, the cause), Johnston and others in America regard it as hyperkeratosis of the lingual papillae.

Robertson, Gleitsmann, Johnston, Levy, Mosher and Danziger have contributed papers on tuberculosis of the oral cavity and pharynx, Bulkley on extragenital syphilis (syphilis in the innocent, 1849) and Goodale, Ross, Freer, Goldstein, on malignant disease.

Tremendous development is shown in our knowledge of the larynx and trachea. The total number of papers reaches about 10,500, of which America has contributed 2,500, almost one-fourth.

Our understanding has attained the highest efficiency in two of the pathologic processes, thanks to the laryngoscope, tuberculosis and malignant tumors of the larynx. Both had been regarded as incurable, as something in nature "noli me tangere." In the first place Moritz Schmidt of Germany in the year 1880 and Heryng of Poland in 1886 proved that laryngeal tuberculosis,

a most frequent disease (affecting about one-third of all cases of pulmonary tuberculosis), is undoubtedly curable and that the rational treatment of the disease is surgical. I must say, however, that the enthusiasm in this respect was later greatly diminished (Semon, Schroetter, Chiari in Europe and Jonathan Wright, Robinson, White, Pierce, Casselberry, in America).

It is noteworthy, however, that Bryson Delavan in America already in 1875 wrote an excellent monograph on laryngeal tuberculosis and that Gleitsmann of New York is one of the most earnest enthusiasts in presenting the matter at the international congresses.

Lactic acid, introduced by Krause of Berlin in 1885, has had its advocates up to the present time (Heryng in Europe, White, Coakley, etc., in America).

I appreciate most highly the orthoform treatment of laryngeal tuberculosis recommended first by Freudenthal and applied successfully by Stein and White, especially in cases of dysphagia (best, *per se*).

Attention, very justly I think, is being drawn to absolute silence as a best curative agent in these cases, especially when combined with climatic treatment in sanatoria. (Semon in Europe and Levy and Freudenthal in America.)

Until we find a specific remedy for the cure of pulmonary tuberculosis, it will be rather fruitless to speak of the radical cure of laryngeal tuberculosis, an opinion which I expressed already in 1889 in my monograph on this subject (*Jour. of Laryn.*).

As to the relation of pregnancy to laryngeal tuberculosis, Freudenthal and others in America agree with Kuttner of Berlin, that artificial abortion is indicated in such cases.

I pass now to the second important disease, cancer of the larynx, which has become a living question, particularly since the time of the German Emperor, Frederick III.

Before Billroth's time, cancer was likewise considered in the light of "*noli me tangere*."

With the first laryngectomy performed in 1873 by Billroth, begins the rational, i. e., surgical treatment of this disease.

It should be stated that in 1864, soon after the introduction of the laryngoscope, the efforts in this direction were made by Elsberg in America, the author of the excellent monograph, "Laryngeal Surgery in the Treatment of Laryngeal Tumors," by the endolaryngeal route, the method later spread abroad, especially by B. Fraenkel of Berlin. The first two laryngotomies (laryngofissure) were performed by American physicians, Buck in 1851

and Sands in 1863. This method is now regarded as the most efficacious in the treatment of the disease, thanks particularly to Semons of London.

It must also be stated that the first lasting result (twenty years recovery) was attained by this method by the Nestor of American laryngologists, Solis Cohen; the best general results being those of Semon of London (80 per cent recoveries) and Chevalier Jackson of Pittsburg (78 per cent).

In my paper prepared for the First International Laryngological Congress, held in Vienna in 1908, entitled "*Die Frage der Radikalbehandlung des Larynxkrebs in den letzten 50 Jahren*" (1858-1908), I succeeded in collecting from the literature, a tremendous number of cases of laryngeal cancer operated on by the different methods, namely, 1,002. I stated that laryngo-fissure gave the best results, about 50 per cent of recoveries, endolaryngeal 46 per cent, presenting, however, much less security as to relapses, partial laryngectomy 22.8 per cent, and total laryngectomy 21.6 per cent. The best results from laryngectomy, total and partial, were obtained by von Bergman and Gluck in Germany, Kocher in Bern, Novaro in Turin, Cisneros in Madrid, and Solis Cohen and Hartley in America.

In the main, laryngotomy (laryngo-fissure) has the greatest number of adherents, including besides Semon and Jackson, already mentioned, von Bruns of Tübingen, Pieniazek of Cracow, Chiari of Vienna, Moure of Bordeaux, and Schmiegelow of Copenhagen.

In addition to Jackson, Bryson Delavan has written in a pessimistic vein upon the subject, and also Stein, Watson, John Mackenzie.

Edematous processes involving the larynx (laryngitis submucosa acuta, erysipelas and abscessus laryngis) have been subjected to considerable elaboration, especially by Kuttner of Berlin in 1895, Massei of Naples in 1885, Hajek of Vienna, 1898-1900, and Semon of London, 1890-1895. The last authority regards acute laryngeal edema or laryngitis submucosa acuta, Massei's erysipelas of the larynx, Senator's acute infectious phlegmon, and angina Ludovici as identical processes, i. e., acute septic infections of the pharynx and larynx.

The American authors who have written on this subject include Pierce on laryngeal phlegmon, and Richardson. Bryson Delavan, among others in America, has written on laryngitis hypoglottica acuta, an affection of the cricoarytenoid articulation, to which Semon drew attention in 1880.

The stenotic processes of the larynx, so admirably described by my compatriot, Pieniazek, have been considered in many valuable papers in America, among others, Price Brown, Fisher and Rogers. Knight, Miller, Casselberry and many others have written upon the etiology, pathology and treatment of vocal nodules (chorditis cantorum), to which Chiari drew attention in Europe.

Roy and Parker advise tracheotomy and thyrotomy in the treatment of papilloma in children. Most European specialists, with Rosenberg of Berlin at the head, favor intralaryngeal operations in such cases.

The greatest progress in our work has been in the domain of nervous diseases of the larynx. This includes the discovery of the phonatory and respiratory centers of the larynx by Krause of Berlin in 1889, and by the English writers, Semon and Horsley, in 1890, and Risien Russel in 1895, the so-called Semon's law (properly Rosenbach-Semon's) as to the greater vulnerability of the abductors of the larynx in organic paralysis, although the cause of this and of unilateral cortical paralysis is not as yet determined, and the origin of the motor nerve of the larynx, which most authors now believe to be in the nucleus of the vagus.

To the names already quoted of those who have distinguished themselves in this field must be added those of Onodi of Budapest, Klemperer and Grabower of Germany, Hooper of America, Masini of Italy, and the youngest Broeckaert of Holland.

Recurrent and abductor paralysis was made the subject of discussion at the annual meeting of the American Laryngological Association in 1908 by Gleitsmann, Bryson Delavan, Casselberry and Clarence Rice.

The laryngeal disturbances (paralyses in *tabes dorsalis*) so minutely described by Burger of Amsterdam, as well as by myself (*Klin. Vortraege. a. d. Geb. d. Otol., etc.*, 1899) have been considered in many papers by American writers, Stein, Freudenthal, Freer, Friedberg. Coolidge has written upon foreign bodies in the larynx, and Emil Mayer of New York upon scleroma, so well described by the Europeans, Schroetter, Stoerk, Juffinger in Austria, Pieniazek and Baurowicz in Poland, and Gerber in Germany.

The diagnosis and treatment of diseases of the trachea and bronchi has also shown great development in the last few years. In this connection, I must mention the new method of tracheo-bronchoscopy introduced by Killian of Freiburg, which permits of the removal of foreign bodies from the trachea as well as from

the bronchi. The excellent monograph by the very distinguished American specialist, Chevalier Jackson, is especially noteworthy in this regard. In addition to this, Newcomb has written an excellent paper on the anomalies, hemorrhage, inflammation and infections of the trachea, Theisen on tumors, Simpson on stenoses, and Coolidge and Mayer on foreign bodies.

Three thousand papers have been published on the thyroid gland during the past twenty-five years, of which more than 700 (about one-fourth) come from America.

Semon of London showed (1883-1884) that the so-called Kocher's cachexia strumipriva seu thyreopriva and the myxedema of the English writers, cretinism and tetany occurred as the result of one and the same pathologic cause, the suspension of the function of the thyroid gland, and Horsley, also of London, proved that these conditions could be successfully treated by thyroid preparations (thyreoidin), which gave the basis for the organic treatment of this disease.

Sajous of Philadelphia has lately written (1908) on the adreno-*thyroid* center (*glandula pituitaria*). Tuholske, also of America, has lately drawn attention to the importance of the parathyroid gland (after its extirpation tetany and death result). Halstead and Richards have also written upon this subject. Wilson, Barker, Stengel, Halstead and Solis Cohen have discussed exophthalmic goitre. The last is not inclined to favor the surgical treatment of the disease; however, Kocher's clinic in Bern showed good results, $3\frac{1}{2}$ per cent of deaths and 83 per cent recoveries. Crile's (America) are not so good—6 per cent of deaths. At any rate the older methods of treating goitre by parenchymatous injections of tincture of iodine and iron are almost entirely abandoned, the surgical treatment being regarded as the most rational one.

Barker adds a fourth symptom to the trinity of symptoms of this disease, exophthalmus, goitre and palpitation of the heart, viz., muscular tremor. He maintains that tachycardia and exophthalmus are wanting in one-third of the cases. Lesonon has written on the thymus.

The literature of the esophagus and its diseases is relatively small, 1,700 papers, of which America provides 500, nearly one-third. Still much progress can be noted in the more recent times, especially along the line of esophagoscopy and gastroscopy, in which regard there is in America one of the leading exponents, Chevalier Jackson. This method and the application of the Roentgen rays have given the greatest aid to the diagnosis and

treatment of certain conditions of the esophagus, foreign bodies, diverticula and neoplasms.

Myer, Mersbach, Halstead, Guizez have written in America on esophagoscopy, Lange on Roentgen ray examination, Schroeder and Ruth Adams on stenosis, Lercher and Huber on dilatations, Farlow on spasms, and Elsner, Seelig and many others on carcinoma.

Mr. President and Fellows and Members of the American Academy of Ophthalmology and Oto-Laryngology: In this short and therefore inadequate résumé, I have endeavored to show the enormous development of our specialty, laryngo-rhinology and otology, since the discovery of the laryngoscope, especially, however during the past twenty-five years. We have seen that America has taken an important part in this development. Allow me, therefore, as a representative of European laryngology, in conclusion, to express to the progressive medical profession of America my sincere wishes for the continued fruitfulness and greater glory of our specialty.

VIVAT, CRESCAT, FLOREAT OTO-LARYNGOLOGIA ET OPHTHALMOLOGIA AMERICANA!

SOME OBSERVATIONS IN THIRTY-FIVE YEARS OF SERVICE IN CUBA PERTAINING TO OPHTHALMOLOGY.

JUAN SANTOS FERNANDEZ, M.D.

HAVANA, CUBA.

(Translated by Francisco M. Fernández, M.D.)

Having been honored by the American Academy of Ophthalmology and Oto-Laryngology with the commission of reading a paper on ophthalmology at its Fourteenth Annual Meeting, I have thought it convenient to give you a synopsis, very brief of course, of my ophthalmologic practice in the Island of Cuba during thirty-five years, but only in that which might be peculiar to an inter-tropical country, as otherwise the description of the work during such a long period of time would be very tedious, as all I have observed I have invariably either written in medical papers or read before scientific corporations.

Before I began, ophthalmology as a special branch was not followed in Cuba, but those who followed it were general practitioners; but, after I specialized in it some noted colleagues have followed it exclusively and with success.

In a paper published in 1893,¹ I said that at the time I established myself in Havana² I thought that the diseases of the eye were more frequent in Cuba than in other countries, and this was due to meager reports given by the writers who, like Carron du Villard, had visited Cuba in the second quarter of the past century.³

From what they wrote it could be concluded that purulent conjunctivitis, even that of the newly born, caused much more harm than we afterward saw, and we even have come to the conclusion

1. Influence of the Climate of Cuba on the Diseases of the Eyes. *Crónica Médico Quirúrgica de la Habana*, Vol. xix, p. 523; *Annales de la Academia de Ciencias de la Habana*, Vol. xxxi, p. 170.

2. Considerations on the Diseases of the Eyes Observed in Cuba During 1875. *Crónica Médico Quirúrgica de la Habana*, Vol. ii, p. 581.

3. Dr. Carron du Villard and his Ophthalmological Works. *Crónica Médico Quirúrgica de la Habana*, Vol. xv, p. 2; *Annales d'Oculistique*, Vol. ci, p. 2. Bruxelles; Diseases of the Eyes in a Tropical Country, Conference Read in the Fourteenth International Congress of Medicine, Madrid, 1903, *Archives de Oftalmologia Hispano Americanos*, Vol. ii.

that the germs which cause it have less virulence in Cuba than in Europe; we have said so in several works.⁴

Concerning the effects of the sun and the wind, there have also been published exaggerated reports; for, although we have observed hemeralopia⁵ in the country laborers and in seamen during the summer, the cases have not been numerous, and the phenomenon might be produced in the same season in any other place under the same circumstances. I can affirm that sunlight, although very intense and lasting many hours in Cuba, affects the sight very little, because it is seldom perceived as reflected light, when it does more harm; and, because Nature, almost always foreseeing, has given the inhabitants of the south a large amount of pigment in the iris in addition to long black eyelashes.

The blepharitis which causes the madarosis of the lids is less frequent in Cuba than in the temperate zones. On the contrary, the bright sunlight diffuses itself abundantly in the houses, and in the summer illuminates them for fourteen or fifteen hours, and this not only makes them healthier, but also limits the use of artificial light, which is condemned because it increases and aggravates myopia and some other affections of the eye. Only during the months of March and April is the dust and wind apt to be troublesome; but this dust and wind is different from that in Egypt, which, together with flies, are considered the transmitters of trachoma, there endemic.⁶ In the great cities, where, on account of the accumulation of the people, the dust might be inconvenient, it is controlled by the constant sprinkling, which is done at least twice a day.

The average temperature (26°) predisposes the organism to imbibe refreshments, and in a way repels alcoholic beverages, which are gratefully received by the system in cold countries.

4. Purulent Conjunctivitis of the Newly Born, *Crónica Médico Quirúrgica de la Habana*, Vol. xxiv, p. 98. Critical Analysis of the Work Entitled "On Purulent Ophthalmia of the Newly Born," by Dr. Osle, *Crónica Médico Quirúrgica de la Sociedad de Estudios Clínicos de la Habana*; *Crónica Médico Quirúrgica de la Habana*, Vol. xxii, p. 438. Prognosis of Ophthalmia Neonatorum; *Archives de Habana*, Vol. xxxv. The Ophthalmias in Cuba, written for the Manual of Sanitary Practice, edited by the National Board of Health; *Archives de Oftalmología Hispano Americanas*, Vol. iv, p. 141. The Prophylaxis of Ophthalmia Neonatorum, *Journal A. M. A.*, June 7, 1907; *Archives de Oftalmología Hispano Americanas*, Vol. vii, p. 227; *Crónica Médico Quirúrgica de la Habana*, Vol. xxxlii, p. 281.

5. On Hyperesthesia of the Retina in General and of that Observed in Several People After the Solar Eclipse of 1878, *Crónica Médico Quirúrgica de la Habana*, Vol. v, p. 60. Hemeralopia in our Ophthalmological Practice; *La Abeja Médica*, Habana. Loss of Sight in the Right Eye Due to Intense Light of Lightning, *Crónica Médico Quirúrgica de la Habana*, Vol. xxv, p. 17. *La Hemeralopie traité par le serum physiologique de cheval*, *Revue Generale d'Ophthalmologie*, Paris, Vol. xix, p. 49. The Resistance of the Eyes to the High Temperature of Bodies Placed in Contact with Them, *Crónica Médico Quirúrgica de la Habana*, Vol. xxix, p. 365. Hygiene of the Eyes in Inter-tropical Countries, *Crónica Médico Quirúrgica de la Habana*, Vol. xxxii, p. 215.

6. Notes sur l'Ophthalmie Egyptienne et les Granulations en Egypt, par S. Baudry (of Lille). *Revue Generale d'Ophthalmologie*, Vol. xxii, p. 12, January, 1903; *Annales d'Oculistique*, Janvier, 1902, Rommier, p. 153, 1899.

Consequently our country is fortunate in not abusing alcohol. There are not many inebriates. During the wars for independence, however, when the Spanish government made nearly all citizens serve as soldiers, an abnormal condition of things existed in both city and village. When I established myself in Havana in 1875, it was not far from the time of the Paris Commune, during and immediately after which the best clinical observations on disturbances of sight by alcohol were made by our teachers of that time, I remember that on my arrival in Cuba I frequently made diagnoses of those affections and wrote about them more than once.⁷ I called attention then to a symptom in the fundus oculi, which had a relative interest, being the atrophy of the external half of the optic disc, and making the recognition of the etiology easier.⁸

With the peace of 1878, the war begun in 1868 was ended, and a short time thereafter the ocular disturbances produced by alcohol disappeared almost completely.⁹ As soon as the second war of independence was started in 1895 we began to note the ocular disturbances produced by alcohol that we had almost forgotten. At the end of this abominable period, sealed by the reconcentration of the country people, mostly Cubans, there was noticed another kind of amblyopia by atrophy of the optic disc, which, although at first we thought to be also caused by alcohol, was due to autointoxications,¹⁰ due to inanition or to very defective and insufficient feeding, induced by the poverty to which the country people were rapidly reduced, as in the Transvaal, obliging them to surrender or to die. The latter fate befell the non-combatant, as the ones who were fighting kept on the hard struggle. With the end of this war, Spanish domination ceased, and with it the large armies; although since 1898, if we have had any menaces due to war, they really did not exist, thank Heaven. We have seen only one or two alcohol amblyopia cases in every 1,500 eye patients during each year, while during the periods of war we had from 60 to 80 cases in the same number of eye patients.

The influence of tobacco on the disturbances of sight also attracted our attention since the beginning of our practice in Cuba.

7. Considerations on the Disease of the Eyes Observed in Cuba During 1875. *Crónica Médico Quirúrgica de la Habana*, Vol. i, p. 591. Hygiene of the Eyesight, awarded a prize by the Academy of Sciences of Havana, 1875.

8. On Alcoholic Amblyopia in the Island of Cuba, and a symptom not Described Before to Diagnosticate it, *Crónica Médico Quirúrgica de la Habana*, Vol. ii, p. 531.

9. War and Alcoholism as the Cause of Ocular Disturbances, *Bulletin de la Société d'Ophthalmologie de Paris*, Vol. xiv, p. 164; *Crónica Médico Quirúrgica de la Habana*, Vol. xxiv, p. 113.

10. Amblyopia Produced by Peripheral Neuritis due to Autointoxications of Intestinal Origin by Deficient Feeding.

Our teachers considered that tobacco caused as much amblyopia and amaurosis of obscure etiology as alcohol, and we came to Cuba under this impression. We remember some cases of atrophy of both optic discs which recently arrived at Paris from Cuba that were considered victims of the abuse of tobacco, which later we could not prove. We were greatly surprised, therefore, when on our coming to Cuba we found that tobacco, the Cuban variety at least, was not the cause of such great troubles, because in 46,000 eye patients observed in a very long period of time, outside of very few cases of amblyopia of easy diagnosis, we have not found those disturbances which were noticed in Europe, and we have so stated it in several papers.¹¹ We have thought those disturbances might be due either to the fact that the tobacco consumed outside of Cuba was more charged with nicotine (excepting that of Mexico, where Dr. Rames' observations agree with mine) or to the constant association of alcohol and tobacco, as in other countries. This fact makes it very hard to indicate the true etiologic cause.

The limited abuse of alcohol in our country, a fact to which we have already referred, renders the diagnosis easier; and, besides, in Cuba the pipe is not used, nor are there tobacco chewers. It is by the last-mentioned way that the absorption of the toxic products is chiefly accomplished. Our colleague at Havana, Dr. E. E. Finlay, attaches great importance to scotomata in the diagnosis of tobacco amblyopia.

We have observed in Cuba what we call "asthenopia of the cigarmakers"; it attacks the young Europeans, who soon become very pale on account of the anemia produced by the heat, the sedentary life which they must lead on account of their occupation, and the constant inspiration of air contaminated by the fumes of tobacco, which are thought by some to be predisposing to tuberculosis. By ceasing their work at the factory and changing their occupation they soon recover and the asthenopia disappears; but it returns if they resume the same hygienic conditions which produced it.¹² The external disturbances caused by the tobacco dust which irritates the conjunctiva are less frequent in Cuba than elsewhere, and we attribute this to the fact that the

11. Differential Diagnosis Between the Amblyopia Produced by Alcohol and Tobacco, *Gaceta Médica de México*, Vol. xxvi, pp. 201 and 204. The Effects of Alcohol in Cuba and the Disturbances of Sight, read before the International Congress Against the Abuse of Tobacco, Paris, August, 1900. Pure Nicotinic Amblyopia, *Anales de Oftalmología de México*, *Crónica Médico Quirúrgica de la Habana*.

12. Ocular Disturbances Caused by the Manufacturing of Tobacco, *Anales de la Academia de Ciencias de la Habana*, Vol. xix, p. 149.

climate favors the building of larger and better ventilated factories.¹³

When we established ourselves in Havana in 1875, there were not the clear conceptions about malaria that we now have. Pernicious fever was daily diagnosed as malaria, and very large doses of quinin were administered. Many patients recovered from the fevers, but remained blind as an after-effect of the quinin. At this time the ocular manifestations due to malaria were not well defined, but it was known that other organs had a tendency to become congested or hemorrhagic. We were greatly surprised, therefore, to find in the cases examined¹⁴ that the ischemia of the disc and the symptoms of the fundus were completely opposed to any idea of congestion or hemorrhage. We knew of the first observation on ocular paludism published by Galezoswi in 1872¹⁵ and those by von Graefe¹⁶ attributed to quinin sulphate, and that allowed us to clearly separate the lesions of the fundus oculi caused by quinin from those caused by the malaria.

At that time three children living in a neighborhood thought to be malarial were treated with quinin and their fever was diagnosed as pernicious. Very large quantities of quinin were administered to them, and all died blind. A young physician and the young wife of another colleague were also taken sick with pernicious fever, both of a very serious character. Although their lives were saved, both remained almost totally blind. The physician had an ischemia of the optic disc, and later on an atrophy of each chorioid. The widow still visits me at times. She has an atrophy of both optic discs produced by the ischemia; however, she can manage herself fairly well.

These¹⁷ and other cases have made us hold out our opinion against others,¹⁸ that, although the prognosis in quinin amaurosis and amblyopia is at times favorable, it may also be extremely serious, as it often ends in permanent amaurosis, which is caused by the total atrophy of the optic disc.

13. External Ocular Manifestations Caused by Tobacco, *Anales de Oftalmologia de Mexico*, March, 1902, Vol. v, p. 267.

14. Disturbances of the Organ of Sight in Malaria, report to the Academy of Sciences of Havana, *Anales de la Academia de Ciencias*, Vol. xiv, p. 413, *Crónica Médico Quirúrgica*, Vol. iii, pp. 433 and 493.

15. *Journal d'Ophthalmologie*, Paris, 1892, p. 5.

16. Amaurosis After the Use of Quinin Sulphate, von Graefe, *Archiv. f. Ophthalmol.*, Vol. iii; *Annales d'Oculistique*, Vol. xxxiii, p. 139.

17. Prognosis of the Atrophy of the Optic Discs Following Quinine Amblyopia, *Crónica Médico Quirúrgica de la Habana*, Vol. xiv, p. 659.

18. J. P. Nunez: Amblyopia et Amaurosis, *Traité complete d'Ophthalmologie*, par De Wecker et E. Landolt. Bergmeister: *Journal d'Oculistique et d'Chirurgie*, 1888, p. 183, *College Medical de Vienne*. Demichieri: *L' Amaurosis quinine et paludeenne*, *Annales d'Oculistique*, 1896, p. 78.

The daughter of a reputable colleague of this city came to me for glasses. On examination I became convinced that there was no error of refraction, and I told her father: "Your daughter's optic discs have the aspect of having had quinin ischemia." "You are right," he answered. "When she was a child, having been attacked with high fever, which was thought to be malarial, she was given quinin and later complained of loss of sight." But, as it was proved that the fever was due to diphtheria, all attention was given to this disease, and the loss of sight was neglected. Fortunately, scientific progress soon made clear the futility of administering large doses of quinin¹⁹ without sufficient cause, and for a long time I have not recorded any new cases of ocular disturbances due to quinin. The last three cases which I remember, two of which were incurable, and all suffering from atrophy of the optic discs, came from abroad.

Yellow fever, which, as we have already stated,²⁰ is the biggest obstacle that Latin America has found to rapid progress, also causes amaurosis. The three ophthalmologic observations²¹ published belong to us. Authors who have written on yellow fever have described the external manifestations, and even pan-ophthalmitis as a result of secondary infections so common in all the infectious fevers, but none has touched on amaurosis in the course of the disease. In one of the cases reported by us the fundus oculi was normal, because the amaurosis was due to uremia, determined by the renal alterations, so common in yellow fever. Fortunately, with the complete disappearance of yellow fever from Cuba, there will be no further opportunity to examine new cases of this terrible disease; and these cases, even during large epidemics, were not noticed, because only from exclusively scientific points of view would one pay any attention to the loss of sight when life is seriously menaced.

Tetanus was considered in Cuba during the time of slavery as a disease to which negroes were more predisposed than whites. This error was due to the fact that negroes working barefooted in the fields very frequently had their feet wounded and the wounds became readily infected. But later on, after they became free and used shoes, tetanus has not been more frequent among

19. In the description for the drugs dispatched to the Hospitals of Paris by the Central Pharmacy in 1907, one can notice the notable diminution in the quantity of quinine. One can see how cautious we ought to be in our therapeutics.

20. Yellow Fever the Biggest Obstacle Found by Civilization in Latin America. Address read before the Intermediary Session of the Second Pan-American Medical Congress of Mexico.

21. On the Loss of Sight in Yellow Fever, Archives of Ophthalmology, Vol. x, p. 440, 1881; Anales de la Academia de Ciencias de la Habana, Vol. xviii, p. 195; Annales d'Oculistique, Vol. cvl, p. 312.

them than in whites, not only adults, but also in the newly born. We have observed in a white man a case of tetanus consecutive to the partial enucleation²² of the eyeball. This patient lived near a stable, and, as at that time the origin of tetanus was attributed to the solipedes, we also attributed it to this cause; but to-day we believe it was due to a serious lack of proper antiseptic care.

Negroes were also thought to be predisposed to the invasion of chigoes that lodged in their feet and disabled them. This infection was also due to the fact that they did not use shoes and were not clean. Oviedo says that there were so many *Pulex penetrans* during the first years of the conquest that the Spaniards who did not take precautions against it became crippled or maimed. Carron du Villards²³ reported a case of pulex situated in the border of the eyelid. These parasites occur in great numbers where swine live. When a boy, another brother, who is also a physician, and ourselves went barefooted to those places and remained standing there about twenty minutes we soon saw the skin of our feet covered with these parasites, which, before burrowing themselves into the skin and developing, are not larger than a pin's point; afterward we ran into the stream and saw them drown.

The people in charge of the swine bathe them near the pen, and in this way prevent the pulex from invading the pig's feet. If any person were to sleep in a place where these parasites are so abundant, we have no doubt but his eyelids would be invaded, as well as other parts of the body.

During the time of slavery Dr. Nicolas José Gutierrez, founder of our Academy of Sciences, observed several cases of filaria in the conjunctiva of negroes recently arrived from Africa, but since then no more of these cases have been observed. We have observed only one case of a very minute filaria²⁴ in the vitreous body of a white man, analogous to the well-known case of Quandry in 1858, and also to the one reported by Fano in 1868. Subsequently Dr. E. Lopez²⁵ of this city observed a similar case in a white woman. Neither of these cases were followed up by a microscopic examination, and they do not tend to enlighten very

22. Tetanus in Traumatism of the Eye and its Appendages, *Anales de la Academia de Ciencias de la Habana*, p. 452. *Crónica Médico Quirúrgica de la Habana*, Vol. xii, p. 147.

23. Notice sur Carron du Villards, par le Dr. J. Santos Fernández. *Annales d'Oculistique*, Janvier et Février, 1889, pp. 11 and 35. *Histoire des Affections Morbides de l'oeil et de ses Annexes Provoquées et Entretenuës par le séjour ou les Atteintes d'animaux Vivants*, Carron du Villard, *Annales d'Oculistique*, Vol. xxxiii.

24. *Crónica Médico Quirúrgica de la Habana*, Vol. v, p. 436.

25. *Revista de Ciencias Médicas*, Habana, 1901.

much the obscurity in which the study of this parasite is shrouded.

There are also probabilities that the first cases of trachoma were introduced into Cuba during the slavery period, although in later years negroes are considered to be practically immune to trachoma. At Matanzas²⁶ there arrived a sailing vessel loaded with Africans, about 300 in number, all blind, and even the crew was affected, as was said, with purulent ophthalmia, but it is probable that they were affected with purulent conjunctivitis. These affected negroes were distributed among the plantations of the island without establishing foci of infection. As we now remember, while we were very young, we never saw negroes with their eyes affected. The Spanish army also may have brought the disease²⁷ into Cuba, for the soldiers were taken from the armies of Napoleon, who, in turn, had contracted trachoma in Egypt; however, the practice of re-embarking the disabled soldiers prevented its propagation to any great extent.

The principal reason why trachoma has never existed in alarming quantities in Cuba is not only due to the relative immunity of the negroes to this disease²⁸ and to the scarce immigration in the past, but to the mode of living that the climate necessitates. Trachoma spreads by the close congregation of people and by the natural lack of hygiene that results from it. In Norway there are only 5 or 6 cases of trachoma in 14,000 cases of diseases of the eye, while in the United States (in Minnesota) it has been found that about 30 per cent. of the Scandinavians suffer from trachoma.²⁹

In Egypt the women and children, who remain constantly huddled together at home all day, suffer more from trachoma than the men, who are most of the time out of doors. Our colleague from Havana, Dr. J. Dehogues, agrees entirely with my views. In Cuba the heat, on the one hand, and, on the other, the breeze from the northeast that exists almost always induces the poorer classes to live in the open air, and this class of people is the most liable to contract the disease.

In spite of the extremely severe measures adopted by the Public Health Department to prevent its introduction into Cuba for the past ten years, they sometimes evade the extreme vigilance, and we have found several cases in which the nurses had transmitted

26. *Annales d'Oculistique*, Vol. lxxv, p. 171, Vol. xxxii, p. 293.

27. *Crónica Médico Quirúrgica de la Habana*, Vol. xxii, pp. 105 and 133.

28. *Abscence du Trachoma Chez le Negre*, par le Dr. J. S. V., *Recueil d'Ophthalmologie*, Paris, 1891, p. 385. *Las Enfermedades de los Ojos en los Negros y Mulatos*, Estadística presentada al xiii Congreso Internacional de Medicina, Sección de Oftalmología, Agosto, 1900. *Crónica Médico Quirúrgica de la Habana*, Vol. xxviii, p. 385.

29. *Ole Bull. Centralbl. f. p.*, August, 1896, p. 322.

the disease to babies, and also several who, although suffering from trachoma, did not transmit the disease to the children in their charge; in these cases this was due to the mode of life that the climate requires. The heat makes the use of water agreeable, and we all know how important water is in public as well as in private hygiene.

Since our first years in Cuba, our statistics showed a considerable less number of affections of the nasal ducts in the negroes³⁰ and we attribute this to the probable wider nasal duct in these people. Subsequently we have proven anatomically, in skulls of negroes, whites and mulattoes,³¹ that the nasal duct in the negro is wider and shorter, and by an exaggeration of its nasal index its inferior orifice is separated more as it opens into the nose.

Leprosy, which also exists in Cuba, is well inspected. The lepers, the majority of whom are secluded, offer a wide field for observing how Hansen's bacillus spares neither the superficial nor the deeper parts of the eye. The eyelids become affected first, then the conjunctiva, the cornea, the ciliary processes and, finally, the chorioid, until the functions of the eye are ruined and the eye destroyed under great suffering, which contrasts greatly with the insensibility that is observed when other organs are affected. I have operated on a leper for cataract by simple extraction with complete success, and I have heard that my colleague, Dr. P. Montalvo, now deceased, had operated on another, also with success. This is explained by the fact that, while the region is not invaded by the leprosy bacillus, it is in a physiologic condition, and the healing process is carried on in a normal manner.

I shall not mention cases analogous to those already cited, as it would make this address unduly long. For those who will honor me by reading it, I shall place at the end a list of almost all my writings, wherein will be found all I have omitted for the sake of brevity. Before closing I shall try, in a few words, to give my opinion in regard to the eye diseases in the Island of Cuba.

Eye diseases are not more serious here than in temperate countries; on the contrary, we believe they, as a general rule, are relatively slight. Ocular affections caused by general disturbances in the organisms are due mainly to some derangement in metabolism which originates anemia. The prolonged high temperature produces anemia, as we have more than eight months of summer

30. Some Considerations on the Diseases of the Eyes in the Different Races That Live in Cuba, *Sociedad Antropológica de la Habana*, 1878. *Clinica de las Enfermedades de los Ojos del Dr. J. Santos Fernández*, Vol. I, p. 243.

31. On the Anatomical Disposition of the Nasal Duct in the Negro, *Archives de Ophthalmologie Hispano-Americaines*, Vol. III, p. 94. Conference given at the XIV International Congress held at Madrid.

without autumn or spring to relieve the heat or help us forget it. Heat lessens appetite and induces inactivity. A deficiency in nourishment engenders anemia, nervous disorders, and, finally tuberculosis in the destitute classes; on this account it reaches a high figure in statistics. On the contrary, in ocular manifestations, lymphatism is not prominent, and we have rarely noted chronic cases in these patients, which, in spite of the new theories, we still call scrofulous.

Outside of the above-mentioned cases, the development of eye diseases does not differ from that which is observed in temperate zones. We have not seen the stubbornness and frequency of rheumatism in manifestations observed in damp and prolonged winters, although we have carefully noted nearly 15,000 cases.

We might say the same about ocular syphilis, but on this subject we are not alone in expressing this opinion,³² for in one of our scientific societies an authority on this subject said that in Cuba syphilis is generally benign.

It might be said that, as the population of the island does not surpass 2,000,000, having a capacity of more than 10,000,000, and the largest city numbering 300,000 inhabitants, the conditions are not the same as in densely populated districts; but this suggestion is ungrounded, for, unfortunately, the death rate of children from tuberculosis in Cuba exceeds that of the largest centers of population. This phenomenon is easily explained; the high and constant temperature makes the mother who nourishes the child anemic; the child can not fail to be susceptible to the effects of a severe and prolonged summer, which affects its digestive tract; thus the disturbances of digestion provoked by carelessness, even while nursed and especially if it is not, cause countless deaths because of the lack of hygiene in the infantile nourishment.

Fortunately, these things which noticeably influence the development of the population and the destiny of the country, slightly affect the ocular conditions of infancy, which, aside from ophthalmia neonatorum, do not differ from those of other countries, while they require the same treatment everywhere.

We must confess that our climate is prejudicial to children for the reasons already stated, and favorable to the aged, who are not exposed to the dangers of crude and damp winters.

Finally, intertropical countries are unhealthy while civilized man does not exert himself. Once this influence is felt, they may be unpleasant if inhabited all the year round, but are of more easy

32. Dr. Pedro Albarrán, Sociedad de Estudios Clínicos, Habana, Session of Dec. 21, 1902.

hygienization than cold countries. And, the Island of Cuba, on account of its location and shape, will one day be the great sanatorium for inhabitants of North America, which, in turn, should be the dwelling place of Cuban children in order to obtain well-developed and strong men.

It only remains for me to thank my dear colleagues for the distinction paid me by calling me from such a distant clime to occupy this stand from which others with their great knowledge have raised ophthalmology to such a very high standard.

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397. Moderate Increase of Trachoma in Cuba in Spite of the Absence of Favorable Causes for Its Propagation. Crónica Médico Quirúrgica, Vol. xxxiv, p. 247. Arch. de Oftal. Hisp. Am., Vol. ix, p. 59.

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404. Exophthalmos Due to Orbital Polyp Originating in the Maxillary Sinus. *Crónica Médico Quirúrgica*, Vol. xxxv, p. 69.

405. Concerning Some Optical Illusions. *Crónica Médico Quirúrgica*, Vol. xxxv, p. 85.

406. A Review of the Spanish Edition of the "Manual of the Diseases of the Eye," by Dr. May, Translated by Dr. Finlay. *Crónica Médico Quirúrgica*, Vol. xxxv, p. 117.

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408. Dr. Rafael Trista. *Crónica Médico Quirúrgica*, Vol. xxv, p. 178.

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412. Convenience of Delayed Intervention or at Long Intervals in Traumatic or Congenital Cataracts. *Crónica Médico Quirúrgica*, Vol. xxxv, p. 313.

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416. A Review of "Necessity of Completing the Higher Instruction, Particularly of the Medical Sciences, as an Important Help," by Dr. M. Menacho. Cuba, Febrero 28, 1909.

417. Difficulties in the Diagnosis of Trachoma in the Inspection of Immigrants and Emigrants. Sent to the Fourth Latin American Medical Congress of Rio Janeiro, August 2d to 9th.

418. Advantages of the Conjunctival Flap in Simple Cataract Extraction. (Sent to the International American Congress of Medicine and Hygiene, held at Buenos Aires, May 25, 1909.)

419. The Proper Disposition of the Capsule of the Lens after the Simple Cataract Extraction. (To Appear.)

ORIGINAL PAPERS

OTO-LARYNGOLOGIC SECTION

THE SOCIAL, HYGIENIC AND ECONOMIC ASPECT OF THE EAR.

CLARENCE JOHN BLAKE, M.D.

Walter Augustus Lecompte Professor of Otolaryngology.
HARVARD UNIVERSITY.

From the social, the hygienic, and the economic standpoint equally the most important consideration of the ear is that which has relation to its major special function, the perception and transmission to the sensory centre of that mode of motion to the perception of which we give the name of sound. Its other function as a peripheral organ of equilibration and its contributive function to space appreciation must of course be considered, but, in reference to the important role which the auditory apparatus plays in the human economy these, together with the cosmetic consideration, may be relegated to an entirely secondary place, except in so far as the sensory response to pressure variations may demand consideration in relation to general hygiene.

Cosmetically the human ear, that part of it which comes into cosmetic consideration, the auricle, has much less physiognomic interest than the more evident features which are dealt with in this symposium. The form of the auricle is, in all races, and in the majority of individuals so definite a constant, with minor peripheral variations, as to make only gross deviation remarkable. The deviation in its level of attachment, in individual cases, is so common and so much a part of the ordinary asymmetry as to escape casual attention and it is only when the deviation is marked, or the imperfection or distortion of the auricle decided, that it comes into cosmetic consideration.

Unlike the eyes, or the nostrils and contour of the two sides of the nose, the external ears cannot be directly and coincidentally compared, their just comparison must be effected on the basis of individual inspection and corresponding differentiation. Abnormalities of the auricle, moreover, are in a greater measure capable of concealment than are facial distortions, and in this respect the ear, cosmetically considered, demands less in the matter of correction than corresponding abnormalities of the more evident facial organs.

Cosmetic surgery of the auricle is, nevertheless, in many instances a matter of important consideration to the individual, and there is the further question, in cases of microtia, for instance, of the possibility of improvement of hearing by operative procedure. Recent investigations in this matter serve to confirm the relegation, by the earlier observers, of cases with marked asymmetry, accompanied by uniform temporal and maxillary flattening, to the inoperable class, except in so far as a partial cosmetic effect is concerned.

As a psychic index the human auricle has long been the centre of conjectural propositions and the subject of interested study; successive observers, with expressions of varying opinion, have attached more or less indicative value to the angle of attachment and of protrusion and the contour of the pinna itself, but a still more extended comparative study of this subject will be required before it will be possible to add elaboration to the current opinion that the psycho-pathologic evidence presented by deviations from the normal, in the contour or structure of the auricle, must be taken rather in co-operation with other facial evidences than as itself a standard of reliable value.

The bearing which the auditory function has upon the social and economic relations of human life is one of much larger scope than is usually appreciated because the function of hearing, primarily, under normal conditions, in excess both as to tone limit and in force appreciation, of the ordinary social and economic demands upon it, is exercised, habitually, under conditions which relegate its operation to the subconscious field; it being perfectly possible, as is evidenced in the slowly progressive kophemia of long standing, to suffer the gradual loss of nearly half of the normal hearing power before the loss becomes socially or economically appreciable.

From the very beginning the auditory function is operative as an educational process; in the higher vertebrates it is effective before the visual function, or any other than major appeals to the tactile sense, and the investigations in reference to sensory appreciation in new-born human infants are as yet uncontroverted as evidence of response to auditory stimuli. The hearing power stands therefore as a primary recipient in the educational life of the human subject, and so continues, increasingly, up to, and into, adult life. Its partial abrogation, or its entire absence, is, therefore, essentially the defect in an educational and developmental process the degree of which can be only partially estimated, by comparison with the normal developmental standard.

The extent to which even a partial impairment of hearing, in early childhood, inhibits mental development is most strikingly exhibited in those children apparently upon the border line between mental deficiency and the consequences of a sense defect in whom the recognition of the latter condition has led to the initiation of remedial measures with consequent influx of auditory stimuli as well as the enlargement of an educationally utilisable channel.

"The generally received opinion that diminution of hearing in children in consequence of disease is rare, is a mistaken one; indeed, in some localities the cases of disease of the ear exceed in number the cases of disease of the eye, and, moreover, they are apparently on the increase; the steadily increasing demands upon the mental capacity accompanying the advances of the times bring the defects of hearing more prominently forward, because they show themselves to be a decided hindrance to the better education of the child. The results upon its later mental development of a marked diminution of hearing in a child are, unless compensated for by other instruction, decided and permanent, affecting the understanding, the character, the self-confidence, and, at a later period, the ability of self-support—mental tools, the possession of which is invaluable, and the want of which can never adequately be supplied." In this view it is certainly a matter of importance that still more attention should be directed to the detection of partial deafness in school children, in order that proper remedial efforts may be made, or, in default thereof, proper compensatory advantages afforded.

Very nearly 25 per cent of the patients attending our aural clinics are children under fourteen years of age. Of this number, 50 per cent are the subjects of suppurative inflammation of the middle ear, and of this number 10 per cent or more owe their origin to the exanthemata of childhood. Of the cases of deaf-mutism throughout the United States, 27 per cent have been the result of suppurative middle-ear disease in early childhood, and it is probable that the more thorough investigation and the systematic examination of the ears of children in our deaf-mute schools, which it is to be hoped will some time be the rule, will show a still larger percentage of these comparatively remediable cases.

The appointment of a competent aurist as a part of the staff of every considerable deaf-mute institution in this country should be regarded as an essential part of the equipment of that institution. For, although the proportion of children in such institu-

tions actually suffering from active suppurative disease of the middle ear is usually not more than 5 per cent, the number of cases of partial hearing for some portion or other of the musical scale or of a vowel-tone perception is much larger than was formerly supposed, and in the schools in which the articulate method of instruction is pursued, the utilization, and possibly the encouragement, of this tone-perception becomes an important factor not only in the patient's ability to interpret intellectually the substitute for sounds which is presented to him, but put him on a better plane of communication with his fellowmen, by helping him to achieve a better articulation himself.

That this influx of auditory stimuli is essential to healthy activity, and that it is as potent an influence in subconscious education and in brain development as are the stimuli afforded by the appreciation of other modes of motion, is incontrovertible. A more correct estimation of the degree of this influence is one of the attractive fields of otological research for which there is ample material already at hand. This material, available under the most favorable conditions of supervision and classification, is the segregated population of the compensatory schools and the institutions for the deaf throughout the United States.

Such expert physical examinations as have, thus far, been instituted in these schools have resulted, in the schools for the mentally defective, in the detection of a certain number of cases, a small percentage but one of individual importance, in which the lack of mental development was really an inhibition, merely, largely remediable by the correction of a hearing defect; while the examinations made in the compensatory schools for the deaf have shown that, of the pupils having any appreciation of sound perception, as distinct from the purely motor sense, very nearly 8 per cent could be so far improved, by remedial and corrective measures as to materially increase their educational receptivity, and in some instances to permit of their withdrawal from the special and their admission to the common school. This system of special physical examination of pupils in schools for the deaf is being slowly extended with excellent results, but with as yet a lack of that correlation of method and of report essential to the larger utilization of the material at command. It is earnestly desirable that members of this Academy who are already attached to such special schools or have instituted examinations therein should centralize their information for purposes of comparison and unification.

The subject is one which might well be considered for a subse-

quent meeting of this Academy, and it is one which would be welcomely entertained at the next meeting of the International Otological Congress, three years hence.

The examination of pupils in other forms of schools for defectives, with reference to remediable aural conditions or the application, educationally, of utilizable remnants of hearing power, is also one of the obligatory services of members of such a society as this.

The differentiation between an actual deficiency in mental operation, a functional deficiency, in consequence of a sense defect and an inhibition as the result of a suspension of auditory stimuli, is often exceedingly difficult, and sometimes impossible except under continued observation; but, it is sufficiently important in its results to make its systematic prosecution commendable.

The social bearing of the increasing percentage of individuals handicapped by imperfection of hearing before, or at the beginning of their formulated education, is one which emphasizes the importance of aural examinations in the diseases incident to childhood. The maintenance of aural clinics in connection with infants' and children's hospitals, with a view to the prevention, so far as may be possible, of the extreme degree of impairment of hearing and the avoidance of conditions which, when once instituted, are slowly progressive and become deleteriously evident only later in life.

The social bearing of the imperfection of hearing which comes either gradually, or sometimes rapidly, beyond the school age, is as varied as the character and the degrees of impairment or the exactive environment of the individual.

The progressive effect upon the social attitude of an individual induced by a gradual decrease of mobility of the sound transmitting apparatus of the middle ear has been feelingly described by more than one writer, out of the depths of a personal experience. The first appreciation that heretofore familiar sounds were either unfamiliar in quality or no longer audible, that accustomed voices were less recognizable by their peculiar individual timbre or lacking in desirable clearness of enunciation, that the determination of the direction of a sound force was no longer a matter of certainty, that certain persistent sounds, heretofore unknown, began to mingle with the general auditory impressions of extraneous origin and, finally, that the difficulty in appreciating the qualitative overtones, which make the distinctive characterization between the consonant checks, demanded a compensatory effort, and the real recognition and confession of a defect.

Up to this point the individual has struggled evasively to keep his recognized place in the family circle, in social gatherings and in business offices and has done this at the expense of a compensatory expenditure of energy which is capable of contributing a considerable handicap, and carries with it a suggestion as to the immediate neural effect, upon the general hygienic condition of a considerable impairment of hearing.

Where the daily ordinary use of the hearing is regarded as the standard of perfection, it is easily understandable that a chronic progressive disease impairing the hearing may become fairly established before attention is turned to the necessity for interference, with a view to prevention and repair, and it is therefore not unusual to find in the majority of the chronic progressive diseases of which the slow impairment of hearing is the important symptom, that they have, by the time they come into the hands of the aurist, long passed the possibility of prevention, and have established a condition which can be in only a moderate degree repaired. The apparent hopelessness of many of these cases, the impossibility of affecting by treatment more than a slight improvement, should be no deterrent to the honest and strenuous effort to ameliorate the condition of cases of this class. It is in many of them that the general practitioner, the family physician, and the specialist can best work hand-in-hand for the deleteriously causative and influencing factors in the general condition in these cases are so many, and the progress toward improvement so slow, that the local treatment may often be advisedly limited to that which the patient can himself effect under the observation of his physician, with occasional examination and suggestion from the specialist. There is probably no class of cases, although coming under the care of the aurist, which is so likely to become the subject of what may be termed over-treatment, either surgical or medical, as the chronic non-suppurative diseases of the middle ear. It is especially in connection with these cases of slowly progressive impairment of hearing that the fatigue of deafness manifests itself. Few intelligent observers outside of the very deaf themselves, or of those who have to deal much with persons so afflicted, can appreciate the profound exhaustion resulting from the effort to compensate for a deficiency in this particular line of communication with the outer world in the person whose perception of that mode of motion to which we give the name of sound was once made without appreciable effort, and who has, under conditions of impaired hearing, first of all to make an effort to hear, and, in default of hearing, an effort

to appreciate vocal utterance by watching the motion of the lips of the speaker; and finally, in default, either through lack of perceptive power or through ability only to catch consonant sounds which are formed in front of the mouth, to solve the puzzle of the spoken sentence by filling in the missing consonant sounds, those imperfectly heard or inadequately seen, from the appreciated context of the sentence; so that where once understanding came without effort, three distinct and appreciable brain-efforts are required: the first, to hear; the second, to see; and the third, to understand. In our estimate of the burdens of life, the consideration of which belongs especially to the ministry of the medical profession, we should, I think, all of us endeavor to estimate more justly as scientific observers, more kindly, perhaps, as fellow-creatures, the nervous strain, the restrictive limit to useful expenditure of energy, and the demand for compensatory consideration for the pitifully deaf.

Aside from the question of its multiple reflex relationships the hygienic aspect of the ear, so far as general hygiene is concerned, is that which bears upon the correlation of its especial function to the general economy while its other hygienic aspect, aside from a purely functional disturbance, is that which has to do with its frequent participation in suppurative processes and its central position in relation to the extension of infection to more vital parts.

Hygienically, the human ear is essentially self-protective, its provision for the disposal of its own detritus, and the removal of small foreign bodies from the external auditory canal is unique and the provision for ventilation and drainage of the middle ear are so adequate as to be but rarely interrupted, other than temporarily by disease; the vascularity, and disposition of the blood supply, especially in the middle ear, favor processes of repair along lines in which the repair will most favor the partial restoration of the sound transmitting function, and the normal ear, unless volitionally interfered with or invaded by disease, is as self-protective as its deep-seated location and guarding environment would suggest.

Economically, the function of hearing must be estimated not only upon the basis of its bearing upon human relationship, but also upon the actual use of the hearing power in the wage earning processes of the trades.

Here, as in the consideration of the purely social question, there are greater degrees of individual discrepancy than beset the failure in function of the other organs of special sense, the reasons

being the difficulty of determining the qualitative degrees of disability of hearing, the importance of estimating the value of compensatory appreciation and the question between the comparative value, in the individual case, of monaural or binaural hearing.

To present illustrative examples would extend this paper beyond reasonable length and it is only necessary to allude to instances in which the hearing while good for the major part of the auditory scale is markedly decreased in minor portions, as the result of tension anomalies, others in which the sound environment has an appreciable effect either in the decrease or the increase of the general hearing or the elevation in perception of certain tones during the prevalence of others and in addition the complex of degrees of general hearing defects presented by cases of partial binaural, partial monaural, total monaural and "penumbral" hearing, all of which emphasize the importance of defined examination as to auditory function of employees having the public welfare in trust.

The records of aural clinics show an increasing observation of cases in which intralabyrinthine pressure causes a series of symptoms very closely resembling those of the so-called Meniere's complex, and in which vertigo plays a prominent and disturbing part. Some of these cases are relieved by the removal of the morbid growths or accumulations, and the consequent release of the labyrinth from extrinsic mechanical pressure, and constitute the class of what may be called the mechanical or aural vertigoes, but it is only recently that the application of lumbar puncture has brought a sufficient degree of relief, in the more obscure cases, to make a protracted continuation of the investigation now in progress advisable.

Recurrent disturbances of equilibration, as influencing the economic consideration of the individual status, introduce an element of uncertainty and instability virtually destructive to the continuous tenure of any objective purpose in life and aside from any remedial, or otherwise protective measures, the proper distinction of these unfortunates from the volitional unfortunates, the alcoholics, cannot be too strongly urged by the medical profession upon those who are the official guardians of our thoroughfares and households. Impairment of hearing is at best a grave misfortune, but the addition of a pronounced disturbance of the other function of the human ear constitutes a veritable disaster.

Equally from the social, the hygienic and the economic point of view, one of the most important functions of the aurist, in his relation to the community, and as a trustee of the knowledge

which he has acquired, is his frank definition, so far as he is able, between the remediable, the partly remediable cases of impairment of function and those for which there is only palliative or some form of compensation.

The recognition of the fact that a slight gain in hearing power, while an insignificant percentage of normal may be a very large percentage of what the patient possesses, is often the beginning of a really helpful relationship; the habitually defective, as to hearing power, are more dependent than the possession of an invisible deficiency would seem to warrant; in default of the impossibility of remedy or amendment, the duty of the aurist by no means is at an end, in token of his ability as well as of his opportunity, it becomes him, as an economist, to endeavor to lighten by instruction, and by counsel, the burden of those to whom the world has become the "abode of silence or of dim confused sound."

The participation of the ear in the sensory appreciation of the individual environment has been estimated as something less than one-third of all the received impressions, where the subconscious receptivity is eliminated it certainly falls below one-fifth and the more distinctly volitional channels of reception correspondingly advance in prominence, but the human ear either considered as an acoustic or as an equilibrating organ stands always on guard, it is the last perceptive organ of sleep, the first to wake and both actively and passively it plays an indispensable part in the social, the hygienic and the economic fulfillment of normal human achievement.

THE THROAT; ITS HYGIENIC, ECONOMIC AND SOCIOLOGICAL ASPECT.

DR. WALTER A. WELLS.

WASHINGTON, D. C.

Some years ago practical men of science began to realize that physical conditions were intimately connected with the mental and moral status of the race, and pointed out that children, exposed to a continuously unhygienic environment, were more prone to develop the evils of degeneracy than their more fortunate fellows.

We are of the opinion, however, that neither sociologists nor hygienists in their public writings and utterances, at least, have given to the question of the relationship existing between their respective sciences that degree of prominence that seems warranted by the consideration of their mutual interests and the advantage which must accrue from their more intimate association.

A helpful, practical sociology should have as its very foundation the study of the best means of preserving the health of the people and a broad, comprehensive hygiene should include all mankind and all ages,—it should consider the health of the child as affecting the adult and that of one generation as affecting the one succeeding.

The scope of hygiene, furthermore, as we conceive it, ought to be not simply the prevention of sickness and the promotion of health—and the end, not as it is generally regarded—nothing further than mere prolongation of life.

It should rather have as its rightful province the security to mankind all that appertains to a useful and happy existence, so that man may the sooner arrive at the realization of his nobler capabilities and attain to the fullest expression of his mental and spiritual, as well as physical, attributes.

Taking this view of hygiene, the throat will be found to assume an importance in the human economy not inferior to that of any other organ.

From the mere standpoint of mortality it seems not to take a high place, for a consultation of statistics shows that dissolution of life is attributed to diseases of the throat *per se* in a very small number of cases compared to other organs.

The report of the census shows that from the years 1900-1904, inclusive, the number of deaths in the United States reached a grand total of 2,642,555.

Excluding diphtheria and croup, we find in this time there were less than 10,000 of these deaths, in which the cause was stated to be some disease of the throat, viz.:

Disease of the pharynx.....	2,434
Disease of the larynx.....	4,097
Tuberculosis of the larynx.....	2,583

As the opinion of many would exclude from this enumeration tuberculosis of the throat, on the ground that the laryngeal affection is secondary, the actual cases of deaths attributable to the throat would be reduced to less than 6,500; that is to say, to not more than one to every 400 cases of death from all causes.

These figures, it is true, might be materially augmented by including cases of croup and diphtheria, which, though reckoned as acute infectious diseases, manifest themselves almost always, and sometimes exclusively, in the faucial structures.

The same census report shows that the mortality of these affections reached the appalling figure of 53,647 in the four years referred to.

Mortality statistics, however, give a very inadequate idea of the hygienic importance of the throat. If it were possible to obtain accurate statistics of *morbidity*, we would see that from a hygienic standpoint no organ in the body is more important. Diseases of the throat are prevalent and numerous; they affect all ages, all races, both sexes; and, while favored by certain seasons and climates, they occur in all, and frequently assume an epidemic form.

From an economical standpoint the throat assumes considerable importance because of the great loss of time entailed to various trades and professions from affection of this organ. Those whose occupations require the use of the voice are, of course, completely incapacitated by diseases of the larynx. School teachers, lecturers, lawyers, preachers, public speakers, and singers, auctioneers and all whose living depends primarily and essentially upon healthy vocal cords, will, of course, suffer more than others, but as every one has to use the voice more or less in the daily contact with his fellows, whatever may be his profession, any disease which hinders this function must be regarded as a serious handicap.

The acute forms of throat inflammation are particularly prone to attack young children, by reason of the predominance of the vulnerable lymphoid structure at the early period of life.

What school is it that has not some child absent every week because of an attack of tonsillitis or adenoiditis.

From a sociological point of view, the question of contagiousness of these acute diseases of the throat is a matter of great importance. Whether we acknowledge or not that ordinary tonsillitis is transmissible by contact of one person with another, nevertheless the impossibility of distinguishing it in most cases from genuine diphtheria without a bacteriological examination demands that the greatest precaution should be observed in all cases.

State supervision with respect to school hygiene and the prevention of the spread of contagious diseases has accomplished very much in our country, and no doubt saved thousands of lives.

The only criticism I would offer with especial regard to throats is that the *whole* stress is laid upon diphtheria as if that were the only disease to be dreaded, ignoring the fact that other agents, especially the streptococci, occur quite commonly and give rise to infection equally as virulent and as dangerous to life.

Mothers, for their part, can do much by keeping a careful watch over the child and suspecting the throat in all cases of fever. It should be her duty to see that the child is disciplined from the earliest age to open its mouth and allow the throat to be carefully inspected. Familiarizing herself with the normal appearance, she will easily learn to recognize a congestion, edema, swollen tonsils or a patch of pseudo-membrane, and understand when a physician needs to be called and when not.

The spread of tuberculosis through expectoration has been so widely preached of late years that the public is keenly alive to this danger. But the possibility of the transmission of grave diseases of the mouth and throat through the habit of kissing remains yet to be impressed upon an entirely too affectionate public.

The inheritance of troubles which especially affect the throat is an interesting question from a sociological point of view, and one which requires to be more thoroughly studied. The laryngologist cannot without difficulty avoid the impression that heredity plays a very important role—not perhaps in the direct transmission of the disease from parent to offspring, but of the constitution or diathesis which predisposes particularly to this class of diseases. The lymphatic, arthritic and scrofulous types are seen with significant regularity.

As regards adenoid growths of the naso-pharynx, I am personally convinced that of all the etiological factors alleged, heredity is the most important. This conviction is based not alone upon the observation frequently made of the co-existence of adenoids in brothers and sisters, but in my own experience at least upon

the fact that I have almost invariably found that the father or mother gave a history, or presented the evidences of naso-pharyngeal disease, and were especially often the subjects of deflected septum and other nasal malformations.

In order to appreciate the important position of the throat in the human economy, we should consider not only the functions of the throat itself which are disturbed by its diseases, but the proximity of important organs which can be involved. The pharynx is unique in that it constitutes the crossing of the respiratory and digestive tracks and must perform in some measure the functions of each. As a consequence of performing this double duty, it is exposed not only to the injurious agencies which attend digestion, but also to those connected with the process of respiration.

Food which is too hot or too highly seasoned can induce hyperemia of the fauces, and caustic agents swallowed by accident or purpose have sometimes produced serious, even fatal, injuries of these parts.

But it is as a respiratory organ that the pharynx has its chief interest pathologically. Whenever the nose fails to perform properly its function of warming, moistening and filtering the inspired air, all that part of the respiratory tract below the nose suffers as a consequence; the membranes becoming dry, parched and inflamed, and finally losing their power of resistance and property of protection.

It is then that whatever noxious elements the air may contain can enter the system and produce havoc.

It is known that the mouth contains normally numerous organisms of many varieties. But if a standard state of health is maintained no harm results, whereas, when unfavorable conditions arise, the proper soil, as we say, these same agents may become virulent and lead to serious infection.

Recent studies have shown that the tonsils when diseased constitute a veritable culture medium for bacteria, and it is quite well demonstrated that it is through this organ that pathogenic agents enter the system which give rise to nearly all cases of rheumatic fever, and in many instances also grave cases of endocarditis and nephritis.

The location of the eustachian tubes is such that any disease in the naso-pharynx is almost certain to involve these canals and to produce deafness and other aural symptoms.

In this connection we are obliged to devote a word or two to naso-pharyngeal affection so much written about in recent years,

the so-called adenoids, because more than any other it is relevant to the special subject of this paper.

The frequency of these growths, estimated by some to occur in one out of ten of all children, by others as high even as one out of five, the fact that they occur in the early formative period of childhood, and so profoundly affect the physical, mental and even moral development of the child, makes it a matter of considerable concern to the student of both sociology and hygiene.

When adenoids were first discovered and described, attention was called to their effects upon the mind.

The child the subject of these growths was found to be stupid, forgetful and inattentive, and lacking in the power of mental concentration—a state to which the discoverer, W. Meyer, gave the name *aproxia nasalis*.

The explanation is found in the obstruction to the lymphatic circulation of the brain, which is brought about by the growth. Furthermore, the location of the adenoid is such that the Eustachian tubes are very frequently encroached upon with consequent involvement of the ears. In fact, a deafness in a child points with almost unfailing certainty to the existence of adenoids, and if we exclude cases due to scarlatina and measles, we would estimate that 95 per cent of all discharging ears in children are dependent upon these growths. These general infections, moreover, are by no means so likely to give rise to aural trouble unless the adenoids have previously existed.

As a normal child does not begin to speak until it is about two years old, deafness which antedates that period will make of the child a deaf mute.

Occurring between two and five years, when speech has been but imperfectly acquired, the result is that this is mostly forgotten and the child is also likely to be practically dumb.

To what extent the lower respiratory tract suffers from the evil effects of mouth breathing, how the nutrition is lowered, anemia results, the general health affected by the insufficient supply of oxygen, in what manner the chest becomes deformed and the growth and development of the body hindered, how the teeth become irregularly placed and the conformation of the entire face distorted—these are questions that have been fully discussed and elucidated elsewhere and need not detain us now.

It is of interest from a sociological point of view that many observers trace a direct connection between adenoid vegetations and degeneracy, and there seems to be no doubt that they are

accountable for a certain degree of intellectual deterioration and in some cases at least moral perversion.

Of functions residing in the throat itself, which may suffer from disease of this organ, we cannot lay too much stress upon that of vocal production—a function of interest not merely from a hygienic and, as we have already mentioned, economic point of view, but also possessing considerable value from a social and sociological standpoint.

Disease located in the larynx will naturally produce hoarseness or loss of voice from interference with the action of the vocal cords; in fact, growths, ulcerations, or disease located in any part of the throat will have its effect in injuring the quality of the voice, as all parts of the throat are concerned in the process of good tone production.

A pleasing voice, no less than an agreeable manner, is a personal attribute essential to success in all conditions of life. It is a function not to be prized merely for aesthetic reasons, but because it has an actual practical value.

The orator sways his audience no less by his voice than by his words; and the flexible voice of the actor is that upon which he most relies, either to excite laughter or to move to tears.

Not only in formal discourse, but in the ordinary walks of life a well modulated, expressive voice is a most valuable asset, whether one's object be to interest, persuade or convince, to give a command or entreat a favor. The moulding of the voice into finished articulate speech is a mechanism in which the entire oral cavity, including palate, teeth, tongue and lips take an important part. As a result of either structural defect of these organs, or—as is more often the case—as a consequence of their imperfect innervation, various logopathies may occur, which profoundly affect the social status of the unfortunate individual and seriously embarrass his way to a successful career.

Lisping, stuttering, stammering, lallation, nunnation and sigmatism, paragammacism and paralambdacism are but a few of the locutory evils encountered much too frequently in adolescents and adults. The fact that they are mostly amenable to treatment and may often be completely corrected, with proper attention and training, is something that needs to be more thoroughly impressed upon our educational bodies and sociologic reformers.

CAUSATION OF THROAT TROUBLES.

Holding that the subject of the throat and its diseases is one of importance to society, it is quite necessary that attention should

be given to the evil causes which can affect this organ and the best means of averting them.

Let us consider then, first the causes of throat trouble in general, and next certain special evil effects upon this organ of certain conditions incident to individual institutions.

GENERAL CAUSES.

Colds.—The throat is affected by all causes known to produce a common cold. It may be affected independently or involved along with the nose. When the latter is the seat of a cold, the throat seldom escapes, being physiologically a part of the same system, it is influenced by the same causes, and anatomically being but an extension downward of the same track, the inflammation readily spreads from one to the other. Moreover, when the nose is inflamed, the throat is all the more exposed and liable to disease, because the current of air which should pass normally through the nose is unable to follow its accustomed path. Owing to the nasal turgescence, it is deflected and obliged to pass directly in and out of the throat, thus adding all the evil consequences of mouth breathing.

The effect of atmospheric conditions in producing a cold is to be explained through the operation of the neuro-vascular mechanism. The blood contained in the body is distributed in three main systems, viz., that supplying the skin, that of the abdominal region and that in the great vascular trunk of the head and neck, including the upper respiratory system.

The neuro-vascular mechanism working normally and maintaining its equilibrium, regulates the distribution of blood in these systems according to their physiological requirements. But in various ways the equilibrium may be upset, resulting in an undue distribution in one or the other systems and a consequent congestion of the corresponding part.

When the skin is exposed to undue cold, the effect is to cause a contraction of the cutaneous blood vessels, and to drive the blood to the internal organs; on the contrary, the effect of heat is to produce a cutaneous dilatation, and consequent abstraction of blood from within. A cold draught striking the surface at one locality while the rest of the body is warm, or rapid alteration of temperature from heat to cold or cold to heat, have each the effect of throwing the centers which regulate the neuro-vascular mechanism so entirely out of balance that it can no longer properly exercise its controlling function.

Under such circumstances the blood vessels of the mucous membrane of the upper respiratory tract—a frequent *locus minoris resistentiae*—are extremely liable to congestion. This is especially true from causes acting upon the skin, between which and the respiratory mucous membrane a peculiar reciprocal relation seems to exist.

Certain standard conditions of the atmosphere with respect to temperature and humidity must be recognized as best suited to the health, and any wide departure therefrom cannot occur without disastrous results.

Excessive heat is as bad as excessive cold, and excessive humidity as bad as excessive dryness. In either case it is the respiratory mucous membrane that suffers beyond any other part of the body.

An abnormal amount of moisture increases the evil effects of either hot or cold air. Heat relaxes the blood vessels, causes them to dilate and thus permits of a greater evaporation, whose naturally compensatory effect is to produce a desired cooling of the body. If, however, the surrounding air is already surcharged with moisture, evaporation is impossible and the system suffers. Everyone is familiar with the oppressive sensation of hot, sultry days.

The effect of cold is to contract the blood vessels, but if the air besides being cold is very humid, the abstraction of heat from the body is unduly augmented. The consequence is the heat-regulating centres are overtaxed and a chilling of the body is inevitable. We are all familiar with the disagreeable sensation of a cold damp day.

A certain amount of saturation is, however, necessary. If the air is too dry, especially warm air, the needed moisture is taken from the respiratory mucous membrane, with the result of rendering these structures unduly dry and parched.

This situation is too often found in some households, especially when furnace heat is employed and no provision is made for supplying moisture. The proper degree of humidity is when the air is saturated from about 65 to 67 per cent.

Impurities in the Air.—The air we breathe is pure enough in mid-ocean, or the mountain tops, but in the customary haunts of men it becomes vitiated by a thousand impurities incident to our modern civilization.

The existence of a certain amount of carbonic dioxid in the air is perfectly compatible with health, but when it becomes unduly increased, whether by the crowded conditions of the room,

or by the product of combustion from heating and lighting without sufficient ventilation, the resulting atmosphere is poisonous.

Few realize the extent to which the air of our habitations becomes vitiated by extraneous matter contained in the dust. This, let us say, is not true merely of the hovels, or habitations of the poor and thriftless, but applies likewise to the sumptuous homes of the rich. The gratification of a taste for heavy draperies and elaborate mouldings is not without its compensatory disadvantages, for there the dust finds naturally a safer lodging, and hygienic conditions are consequently set at defiance.

Uffelmann, making studies of the bacteriological contents of the air, found that while the outer air in the vicinity of his home contained about 250 germs to the cubic foot, in the air of his library there were 2,900, in that of his sitting room 7,500, and in that of the bed-room 12,500 to the same space.

The damp, dark cellars of some houses are responsible in many cases for serious inflammations of the upper air passages, and especially is this true when quantities of organic matter are allowed to remain. This soon undergoing a state of greater or less decomposition, gives rise to an effluvia exceedingly deleterious to the health of the inmates of the household.

Many serious throat troubles are also traceable to the escape of sewer gas. When pharyngitis, tonsilitis, or laryngitis continue to recur in the same household, this possible origin should be borne in mind and the plumbing carefully inspected. Trustworthy chemical observation has established the connection of many infectious throat troubles and especially diphtheria, with air polluted in this manner.

Neglected cess-pools and imperfect public sewerage and defective drainage may indeed threaten the health of the whole community, and so become the proper subject of the sociologist, working jointly with the hygienist.

Many other noxious constituents occur in the air of all populous districts, as smoke, coal, dirt, grime, cinders, soot, etc.

It must be remembered, however, that external conditions are not the sole causes of affections of the throat, for many are traceable to the several disorders and derangements of the internal organs. We have spoken of the intimate relationship which exists between the vascular systems of the skin, upper respiratory tract and abdominal region. It is in this way which probably explains the observations of many clinicians that many throat troubles arise from inactivity of the function of the skin or bow-

els, and are not thoroughly cured until these conditions are corrected.

Excesses of all kinds are bad for the general health, but three to which the race is most prone have been observed to have a selective influence for evil upon the organ we are considering.

We refer to excesses of sexual kind and the abuse of alcohol and tobacco.

The tobacco throat is a type well known to the laryngologist. The evil is doubled in the case of this organ, because to the poisonous effect of the nicotine or other ingredient, we have added the injury to the delicate mucous membrane from the process of combustion. When the smoke is inhaled, the vocal organs are obviously more likely to suffer.

Constant overindulgence in alcohol is almost certain to affect the throat. A typical form of post-nasal catarrh marked by the matinal recurrence of an obstinate hawking and wrenching is very often met with. A chronic hoarseness too is a very common attendant.

Industrial Conditions.—That a very large part of mankind engaged in the various trades and industries made especially necessary by the artificial institutions of modern society, are exposed to conditions absolutely inimical to their health, is a serious question for the sociologist.

Persons living in ease and luxury will seldom reflect that the comforts which they enjoy, their less favored brethren have produced, not merely by the sweat of their brow, but at the expense of their health and often at the risk of their lives. How many young girls have injured their eyesight sewing in ill-lighted workshops in order that milady shall be beautifully attired; how many young men have their hearing impaired by the hammering of iron and brass and the roaring of machinery in order that apartments of the rich shall be fitted with gorgeous furnishings?

How many persons of both sexes and all ages have ruined their throats, injured their lungs, impaired their kidneys and been deprived of the pleasure and beauty which Nature has intended for all mankind—simply because these same unfavored ones must earn a livelihood and could not do it except under these deplorable conditions?

In recent years the central government has been giving some attention to these questions, and certain of the states have made most commendable progress in doing what could be done to ameliorate the hardships and improve the hygiene of some of our industrial institutions.

Mr. Roosevelt especially deserves credit for creating the Homes Commission for the investigation of the conditions of our laboring class, and the splendid work which has been done by Dr. George M. Kober, of Washington, and his fellow-committeemen in collecting material and pointing the way to the betterment of conditions, cannot be too highly praised.

In the consideration of industrial institutions as affecting the throat, it is not possible always to consider these independently of those which affect the other parts of the respiratory apparatus, for as a rule the whole respiratory tract will suffer more or less from the same cause. Shops in which the air is damp and foul, in which draughts are common and ventilation poor, and those especially in which various extraneous or adventitious products are set free in the air are the kinds which produce troubles of the entire respiratory tract.

The nature of the dust will, of course, differ according to the factory.

It may be a vegetable dust, as that of flour, flax or that of certain textile industries; a dust of animal origin, as that present in woolen mills and factories in which articles of horn, bone, etc., are made; a mineral dust, as that to which miners are exposed; some tradesmen have to contend with a fine metallic dust, as grinders, steel polishers, etc., others a dust so coarse as to cause abrasion of the mucous membrane. Finally, in those factories where acid and chemicals are largely used, the atmosphere is often permeated with fumes and vapors of a highly irritating character. In certain rug and carpet factories the dust has been observed to be so thick that it was said to be almost impossible to see across the room. The effect upon the throat of breathing an atmosphere of this kind can easily be imagined. That such industries are inimical to the health of the employees, and especially injurious to the respiratory membrane, has been established by reliable statistics from competent observers.

Roth found that the mortality of persons engaged in *dusty* occupations of various kinds was 5.42 per 1,000, as compared with 2.39 per 1,000 of persons engaged in *non-dusty* employment.

The record shows that bakers and mill hands are very prone to disease of the throat and lungs and the same is true of laborers in grain elevators.

Wool sorters' disease is a well-known occupational infection due to the anthrax bacillus.

This and other serious infections occur often also in paper and

burlap factories and are attributable to the beating of old rags used in the manufacture of these articles. The thick smoke, laden with cinders and soot, to which firemen, engineers and railroad men are exposed, cannot be without great injury to the throat. That coal miners are subject to serious throat and bronchial affections is well known and only to be expected. In certain factories, where emery wheels are revolving wire brushes, the air of the room becomes laden with a fine steel and emery dust very harmful to the throat, and the same is true of mica dust, found in places where bronzing powders are manufactured.

Glass polishers and cutters, needle polishers, cutters and grinders are others whose occupations expose them to dusts extremely injurious to the membranes of the air passages.

Slate and stone-cutting are likewise dangerous trades. Of 2,013 stone-cutters examined by Sommerfeld, he found that a proportion amounting to 19.7 per cent were afflicted with consumption and about 18 per cent with other diseases of the lungs, and that all had chronic catarrh of the throat.

Of industries attended with the escape of irritating fumes from chemicals employed, we should mention galvanic works, where HCl is largely used in the pickling process; the manufacture of glazed bricks, requiring the use of sulphuric acid, and bleaching establishments where various chemicals are used of a more or less harmful character. In chromic acid factories the workmen are known to be subject to extensive ulceration in the mucous membrane of the nose and throat.

In felt hat factories cyanide of mercury is extensively used with harm to those engaged in this industry.

Aphonia is found to occur very often in establishments where copper, antimony and phosphorus are employed.

Lead poisoning is a very frequent accident found among those engaged in the roasting of ores, in the manufacture of white or red lead; sometimes found also in china and pottery factories, in plumbers, type-setters and painters. An offensive breath, a sweetish taste in the mouth and a blue line around the gums are reckoned among the earlier symptoms of this form of poisoning.

Besides the dust, other elements may enter into the causation of throat troubles among industrial workers.

We can have added thereto the injurious results which will accrue from the accumulation in the air of workshops or unsanitary dwellings of the product of either respiration, combustion or decomposition.

HYGIENIC APPLICATION.

There are three possible ways by which reform of the evils connected with industrial institutions can be accomplished, viz.:

- 1—through governmental intervention;
- 2—voluntary reform on the part of the management;
- 3—intelligent co-operation of the workmen themselves.

Of what the state can do and of the progress it is actually making throughout the country, mention has already been made. It is gratifying to record that in many instances employers have taken the initiative in providing for the health and comfort of their employees, and have, as far as possible, minimized the dangerous and destructive feature connected with their industries.

In doing this, as a rule their own interest will not be found to be in conflict with their humanitarian acts. The saving in sick leave and the more efficient work done proves generally in the end actual economy. But often, although the state may do all that it is permitted to do and the management all that it can, yet if the individuals themselves will not follow the laws of personal hygiene, trade disease will continue to occur.

Lack of personal cleanliness, over-indulgence in alcohol and tobacco, the habit of some workmen of loitering in stuffy saloons where the air is foul and laden with tobacco smoke, and carelessness in regard to sanitation in their own households, will defeat the best efforts of both state and private management.

The Massachusetts Board of Health investigating some years ago the factories of the state with regard to hygienic matters called attention to the fact that in numerous institutions where respirators were furnished by the management, the employees neglected to use them. Thus ignorance, mere carelessness, and, in some cases, false pride, have barred the way to health and happiness.

Let us in conclusion very briefly indicate a few of the precautions that should be observed with special reference to the avoidance of diseases of the throat.

Ventilation.—The amount of CO_2 in the air should never be allowed to reach a higher proportion than from 5 to 10 per 10,000. Various methods exist of providing fresh to supplant the foul air, as ventilating bricks, shafts and hoods.

Removal of Impurities.—In the case of factories especially attended with the production of injurious dusts, fumes and other products filling the air, special provision must be made for their removal. This may be accomplished by means of absorption, by

water and chemicals, by condensation, or distillation, by combustion of gases, by forced ventilation, or by discharging of gases into the air at great height.

In many factories exhaust flues must be attached to the machinery in order to take up the dust. This method is carried out successfully in a number of boot and shoe factories. In shops where tumblers and emery wheels are used, they should be provided with hoods and blowers; and in factories of various sorts, upward suction draughts are found necessary.

Proper care of floors and furniture is a matter which must be given careful attention. Diligent sweeping, scrubbing and washing will go a long way to avert evil. In mercury and phosphorus factories the floors need to be frequently cleansed with damp sawdust and sprinkled with a solution of ammonia.

In wool industries and others in which infected material is used, systematic disinfection is indispensable.

PERSONAL HYGIENE.

Persons employed at trades which especially threaten the throat must themselves take precautions to prevent such troubles.

The use of helmets or respirators is absolutely necessary in certain factories, and to fail to use them is suicidal.

In occupations requiring the handling of poisonous substances frequent washing of the hands is important. Disinfecting agents may need to be used in some instances. The working clothes when soiled must be removed, and subjected to thorough weekly washing, and in the case of those constantly exposed to a dust-laden air, it is highly important to practice a daily gargling of the throat with some suitable detergent having antiseptic properties.

It is not to be expected that in a paper of these limitations it shall deal exhaustively with the subject of diseases of the throat, caused by industrial conditions. Much more might be written as to their exact manner of causation, their nature and extent, and the means to be employed in preventing and curing them. From the standpoint of hygiene, economics and sociology, prophylaxis is the watchword—and prophylaxis demands above all other things a knowledge of causation.

There is one fact which finally we wish to emphasize, and which must never be fully lost sight of,—and that is, that diseases of the throat, like all diseases, are seldom traceable to single causes, but a multitude of causes; not merely to influences acting from without, as cold and damp air, draughts, injurious dust,—for

these would prove less often efficacious, if at the same time there were not internal conditions which lowered the vitality of the parts and lessened resistance.

Through bad habits, carelessness, neglect or abuse of the organ, the throat can very easily become a *locus minoris resistentiae*, and so fall prey to influences which otherwise would prove harmless. Disorders of the general system and disease located in other organs of the body may, too, have their effect upon the throat reflexly, by direct extension, or through the intermediation of the circulation.

The inference is that no law of hygiene, no matter how slight it seems, nor how irrelevant it may appear to be as regards the throat, can be disobeyed with impunity, and that the general health must be taken care of and the whole body kept in as near as possible to a normal condition.

THE SOCIAL, HYGIENIC AND ECONOMIC ASPECT OF THE NOSE.

JOHN J. KYLE, M.D.

INDIANAPOLIS, IND.

In discussing the social, hygienic and economic aspect of the nose, we shall not go back into the dim and hazy past and recount the origin of the name, or the successive steps taken by the builders, covering many hundreds of years, of the science of Rhinology. The classic "History of Rhinology," by Jonathan Wright, will probably live as long as we have books, as the one important contribution in the English language illuminating the past with sufficient brightness for us to appreciate the successive steps in the development of our specialty and its progress among the nations. Rather shall we confine our task to conditions as we find them existing to-day, discussing each subdivision of the subject, hoping to thus avoid confusion.

SOCIAL.

We cannot consider the social aspect of the nose without taking up that oft-discussed science of physiognomy, if one may designate it as such. Levater's essays on physiognomy, illustrated by upwards of four hundred profiles, have, ever since their publication, been the guide to the study of the human face. Herbert Spencer, and notably Darwin (1872), have also made extended observations on the expression of the face in laughter, pain, fear, blushing and other human emotions.

It may be observed that the more cultured and refined the race, the finer is the nose—the more graceful in lines and expression, thus conforming with the intellectual development. In the lower races the noses are much alike, but with the advancement of the race, there is a greater variety observed. Each nation has certain general characteristics. However, comparison shows that no two individuals are exactly alike. The size, shape and intellect of individuals are suited to the nature of their environment, and as the environment changes, physical and mental characteristics correspondingly change, the physical influencing the mental and *vice versa*, and in none of the human features have we greater evidence of this than in the nose.

Leonardo da Vinci says: "Noses are of ten species, according to whether they are straight, arched, hollowed, elevated above or below rather than in the middle, aquiline, snub, round or pointed. These directions only hold good for noses seen in profile. From

the front there are eleven forms of noses; they may be equal, thick in the middle, thick at the point and thin at the junction, they may have wide or narrow nostrils, high or low, with the apertures laid bare or hidden by the point."

In considering the nasal characteristics of nations, we must look to the science of ethnology for information in regard to shape. According to Samuel A. Wells, there are five classifications of racial noses based on the profile, the Roman, Grecian, Jewish, snub, and Celestial.

The typical nose of the race can only be found in a nation which has lived for ages in a certain isothermic zone. When the species begins to migrate from hot to cold zones, or *vice versa*, the shape of the nose begins to change. According to Major Woodruff, U. S. A., the nasal index or extreme width of nose divided by the extreme length, gradually increases as we go from colder to hotter countries, where we find some races with noses much greater than one thousand, i. e., width greater than length. In races permanently inhabiting hot, dry countries, the nostrils are open and wide and the nose very flat. Thus the shape of the nose is governed by racial characteristics and isothermal boundaries.

The Anglo-American nose is said to be a combination of the Roman and Grecian, with just a turn of the Jewish. Such a nose was possessed by Dr. Ambrose Pare, who was designated by Lawrence Sterne in *Tristram Shandy*, as the Chief Surgeon and nose-mender of Francis IX., of France.

The Jewish nose is characteristic of the Israelite, Syrians and Arabs, and to them we attribute commercial, aggressive and intellectual qualities. When combined with the Grecian and Roman, such a nose is the ideal nose of achievement.

Again quoting *Tristram Shandy*, the possessor of a snub-nose is "so snubb'd, so rebuff'd, so rebated and so refrigerated thereby, as never to arrive *ad mensuram suam legitimam*." Society probably owes little to the snubbed-nose individual; the achievements of the snubs are nil compared with those of the Greco-Roman. Kosciusko, the great Polish liberator, stands out as the one important historical character possessing a snub-nose.

The size of the meatus of the nose is regulated, first by the respiratory and olfactory necessities of the individual; however, observers report that these functions have been somewhat lost in the growth of the human race. The dilator fibers have largely lost their function and there is no doubt that in the higher races olfaction is not so acute as in the lower types.

In most mammals olfaction is much more developed than sight.

In low forms of life olfactory sensibility is closely related to the tactile, and in the ascent, as observed by Havelock Ellis, olfaction becomes subordinated to taste and sight. In the savage races, for self-preservation, olfaction is quite as essential as sight and hearing.

Many races of man have characteristic body odors. The negro tribes of Africa, their descendants, and the South American Indian emit a peculiar and typical odor like that of a goat, which is quite easily detected by the white man. According to Ellis, many Chinese can detect by the sense of smell when a European has been in the room. The odor from the Caucasian is said by negroes and Chinese to be that of death, a heavy, flat smell. The literal translation for the word, "foreigner," in Japanese, is animal smelling. Americans and Europeans traveling in Japan will avoid much offense to sensitive Japanese by discarding woolen garments, for it is probably the odor from the wool which is so repulsive, rather than the body odors.

Havelock Ellis in his six volumes on the "Psychology of Sex," treats especially of odors and their influence upon suggestion, emotion, religion and morals, action upon the heart, vasomotor system, and muscular activity. In one instance he speaks of the custom among certain Philippine tribes, of lovers changing their garments to have the odor of the loved one about them. Not infrequently the sexual inclination of one individual toward another is greatly influenced by olfaction. Some odors excite and others repel. The method of salutation by rubbing the noses together or touching the hand to some part of the face, common among many tribes in Africa, India and the South Sea Islands, is classed by Ellis as "sexual attraction by personal odor." Smelling by contact is possibly the earliest known salutation. This is exemplified also in lower animals.

The nose is important as a diagnostic guide in general diseases. The saddle, notched and eroded nose is suggestive of syphilis and scar tissue, with or without structural change. "Down with the nose, down with it flat; take the bridge quite away," said Timon, the misanthrope, speaking from his cave to the mistresses of Alcibiades. A thin and very pointed nose with thin lips, or a thick nose, thick lips and red hair, are objective symptoms of a tendency to general pulmonary tuberculosis. A tendency to nose-bleed is a suggestive symptom of local or general pulmonary tuberculosis, purpura hemorrhagica in infants, epithelioma of the nose, ulcer or varicosities of the septum, and is also considered an early symptom of typhoid fever.

Hemorrhage from the nose or mouth in the new born, usually occurring within three days after birth, suggests the following causative factors, according to Tuley, *Journal American Medical Association*, December 26, 1908: "Prematurity, atelectasis, deformity of the heart, persistent foramen ovale or ductus arteriosus, ulcer of the stomach and intestine, the latter due to a venous stasis, followed by a thrombosis; fatty degeneration of the arterioles; extreme delicacy of the blood vessels; congenital obstruction of the portal venous system; congestion from pulmonary, cardiac or hepatic diseases; excessive secretion of gastric juice resulting in partial digestion of the mucosa of stomach and intestine; congenital hemophilia and the great changes taking place in the circulation incident to birth," and with a mortality of over sixty per cent.

Diseases and deformities of the nose vary in races. There is probably a greater multiplicity of diseases in the higher than in the lower races, and one form of disease may be more prevalent in one race than in another. It is said that the Apache Indian, probably the greatest warriors in point of endurance that the world has ever known, always breathe with the mouth tightly closed.

According to John A. Fordyce, *New York Medical Journal*, March 6, 1909, catarrhal inflammation of the skin may alternate with that of the mucous membrane, the one being active while the other is held in abeyance. Other conditions observed by Fordyce occurring in the nose are urticaria and angioneurotic edema. The mucous membrane of the nose may participate in impetigo of Bockhart from autoinoculation with the streptococcus, some forms of purpura, and certain drug urticarias. Fordyce also describes Gangosa, a disease of the tropics, and says: "Gangosa consists of an ulceration of the nasopharynx, extending from thence to the skin of the face and producing great deformity. It is met with in natives on the Island of Guam, Fiji, British Guinea, and in all probability in the West Indies and Polynesia. * * * The ulcer has a punched-out appearance, undermined edges, and a deep, uneven floor; it progresses rapidly, destroying bony and soft parts with equal ease. Its activity may continue indefinitely or may become arrested at any time, or after a period of quiescence it may become active again. The general health is unaffected, although fulminating cases occur in children which terminate fatally in forty-eight hours. The disease extends from the nasal and oral cavities to the face, destroying the nose, lips and eyes. The tongue and muscles of deglutition usually escape. The etiology of the affection has not been determined."

Many other diseases, among which are leprosy, lupus erythematosus, lupus vulgaris, tuberculosis, erysipelas, impetigo contagiosa, pemphigus, diphtheria, rhinoscleroma and anthrax, have a predilection to primary origin in the nose.

The nose so aptly described by Riley, the poet, as being alike to a "Bartlett pear," indicates seborrheic eczema. The disappearance of the nasolabial fold, which gives a characteristic blank expression, is one of the early signs of bulbar paralysis, and also dementia or general paralysis of the insane. The play of the nostrils in febrile disease is highly suggestive of an advance in the general process. A deformed nose from fracture or traumatism may suggest acquired lower respiratory disease. Fetid nasal odor suggests syphilis or suppuration in the sinuses.

The tendency to pick the nose is symptomatic of an unstable nervous system. Violent scratching of the nose at times may be the first sign of the morphine habitue. A habitually cold nose suggests some circulatory disturbance and possible heart lesion. The movements of the nasal alae may help us to differentiate the presence or absence of some respiratory obstruction. In cyanosis from respiratory disturbance, the alae move with respiration, and in heart lesions or general intoxication, no perceptible movement is noted. Sudden drawing of the nose to one side is sometimes noted as a preliminary aura of epilepsy.

In a patient evincing great pain in the top of the head and occiput, with or without much temperature, clonic contraction of the nose and face muscles to either side, may accompany an acute exacerbation of a chronic basilar meningitis. Without pain or temperature, it is a prominent symptom of hysteria.

Upon careful inspection in acute coryza in a child, a mild case of measles is often disclosed.

Tumors, abscesses in the anterior fossae of the skull, tabes, suppuration in the sinuses, or disease of the cortical center may be suspected in anosmia. Hallucination of smell is often an accompaniment of epilepsy or insanity, and may be the first sign of the approach of these diseases. Havelock Ellis says: "Hallucinations of smell are comparatively rare as compared with hallucinations of sight and hearing; they are commoner in women than in men, and they not infrequently occur at periods of sexual disturbance, at adolescence, in puerperal fever, at the change of life, in women with ovarian troubles, and in old people troubled with sexual desires or remorse for such desires. They have frequently been noted as especially frequent in cases of excessive masturbation."

A chronic red nose is indicative of gastro-intestinal irritation, or of an active membership in the Bacchus Club. An acute redness of the nose with itching and slight edema may be erythematous in character, due to an unstable vasomotor system and gastro-intestinal disorders.

Cavernous sinus thrombosis, sudden blindness, refractive error and disease of the adenexa of the eye, may point to a causative lesion in the nose. Subjective aural sounds may be due to some lesion in the nose or nasopharynx enervated by the trifacial nerve.

Hyperosmia, or over sensitive olfaction to specific odors, may produce in those with an idiosyncrasy, congestion of the upper air passages, headaches, nausea, muscular excitement, cerebral congestion, skin eruption and sexual excitement sufficient to incapacitate the individual from many duties, unless the environment is changed.

Anosmia, or loss of smell, may be due to fracture of the skull or nose, central lesions, local or general disease, and may be found in acromegaly, as pointed out by Sajous, who also says that the olfactory sensibility may be influenced indirectly by ischemia and impaired nutrition through the sympathetic system and pituitary body.

The study of truancy and delinquency is a source of interest to the rhinologist, and abnormalities may be looked for in the nose, especially in the instinctive criminal as differentiated from the occasional criminal. Juvenile Court Judges are constantly sending delinquent children to the rhinologists, looking to the possibility of some abnormality, if not in the nose, in some portion of the body directly influencing the morals of the child, and it seems to me that it is time that we correlate facts in regard to this subject. Boys and girls with nasal or postnasal obstruction frequently receive surgical treatment and are subsequently lost from observation. We must confess that in those cases with a family history of delinquency, we are inclined to look with suspicion on the chance of doing much good for a criminal by intranasal operation.

Structural alterations of the nose from such diseases as syphilis and tuberculosis are important evidences pointing to disease that may influence the nervous system.

One cannot take up the study of criminology without consulting Lombroso, Ellis and Drahts. Medical writers frequently refer to the stigma of degeneracy without giving the subject much comparative study. Lombroso speaks of the frequent deep frontal sinuses in female criminals and abnormal nasal bones found among prostitutes. He found crooked noses in twenty-five per

cent of criminals and eight per cent prostitutes. Twelve per cent homicides and twenty per cent thieves have flat noses in nearly one thousand observations. The sense of smell is reported as affected in six per cent, whereas in the normal, this defect is only found in two per cent.

Drahms says that the nose of the criminal is "generally rectilinear, large, frequently crooked, or malformed, with large wings and orifices, sometimes undulating and with uplifting base." Many of the malformations may be attributed to abuse by the parents in infancy and general recklessness of the individual.

To conclude our observations upon the social aspects of the nose, we might add that classic literature and art owe much to the nose as a theme for thought and discussion, and even the stage is indebted to the nose for some of the most attractive plays, a notable example of which is "Cyrano de Bergerac." Greek art, especially sculpture, owes much of its beauty, attractiveness and individuality to the nose, and the best examples are preserved in marble.

HYGIENE.

We will, for convenience, consider the hygienic aspect of the nose, first in its relation to the general economy, and, second, the special hygiene of the nose.

The function of the normal nose is that of a hygienic organ. The cilia of the nose filter the inspired air, thus materially preventing the entrance of foreign substances into the nasal cavity and lower respiratory organs. The secretions from the nose are slightly bactericidal in character, thus preventing the propagation of bacteria and rendering those present somewhat innocuous. Nasal secretion also aids in supplying moisture to the inspired air as well as lubricating the throat; it counteracts acid formation and aids in digestion. The nose is also the receptacle for fluids and debris draining from the lachrymal duct. The olfactory sensibility frequently prevents the exposure of the individual to the ingestion of foods and liquids detrimental to the system, as well as preventing the individual coming in contact with sources of infection or areas filled with irritating gases.

The sense of taste is greatly influenced by the sense of smell, and thus the ingestion of suitable foods is governed by olfaction, this being particularly true in animals and the lower races of man.

The sensation in the mucosa is for the protection of the nasal fossa against obstruction from bodies and against irritating gases and dust particles which affect the larynx and lower air passages,

sometimes producing spasm of the larynx. Sneezing is an expulsive act.

To me it seems incontrovertible that the hygiene of the nose has received too little attention from the rhinologist and physician in general. We neglect the general principle that to maintain its perfect function, it is necessary that the nose have special attention. Nature tries to fulfill the requirements of the body, but when environment has overloaded her capacity, assistance is necessary. In spite of the nose being a hygienic organ, bacteria, irritating dust particles and chemical products of bacterial activity are present, requiring artificial cleansing and antiseptic agents for their removal.

Many of the infectious diseases, such as scarlet fever, smallpox, measles, diphtheria, pneumonia, la grippe, meningitis, typhoid fever due to infected dust, plague from an abrasion of the skin or mucous membrane and infection with the bacillus pestis of Kitasato, and gastro-intestinal disorders, have their origin and atria of infection in the nose and nasopharynx. The nose of a healthy individual may possibly be a carrier of infectious diseases. This infection is more often carried through the air from the nose and throat of one individual to another, than from the skin, and by hygienic measures could probably be prevented from securing a new foothold. We know that it is a matter of daily observation that many of the so-called catarrhal fevers respond much more rapidly when attention is given to frequently cleansing the nose and throat with mild alkaline douches and sprays. In scarlet fever many of the severe angiotic symptoms are likewise mitigated. Many suppurative affections of the ear are dependent primarily upon the unhygienic condition of the nose and nasopharynx, and where this is corrected the symptoms disappear. The spread of acute coryza can only be prevented by hygienic measures. Acute or chronic suppuration of the sinuses is best prevented, or even cured by early cleansing of the nasal cavity. An acute or chronic suppuration of the sphenoid sinuses may have its origin in post-nasal adenoid tissue. The course of the suppuration may be favorably influenced and the diseases even cured by the early removal of any diseased adenoid tissue.

The olfactory function of the nose is dependent upon a clean surface, and when the secretion is filled with bacteria, and debris is allowed to cover the surface, this function is partially lost. The smoke from burning coal in cities is a menace to human life—not that the coal smoke in itself is so objectionable, but in the moist

atmosphere the production of combustion mixed with dust fills the vestibule, mats the cilia together and prevents their function.

Dust particles affect the sensory function of the mucosa, and if allowed to remain on the mucous surface, act as irritants and predispose to hypertrophic changes in the mucosa and systemic disturbances.

Atrophic rhinitis, if not alone dependent on faulty hygiene of the nose, owes much of its chronicity to suppuration in the sinuses, the result of imperfect drainage.

Among the causes of nasal stenosis, which is the important factor in imperfect nasal hygiene, are traumatism, inherited influences and recurrent attacks of inflammation. The usual pathological conditions are deflected septum, specific or non-specific hypertrophic changes, polypi, and sinus suppuration.

The general effect of these conditions upon the individual is varied; it may include mouth breathing, faulty cerebation, asthenopia, retrobulbar neuritis, orbital cellulitis, gastro-intestinal disorders, faulty metabolism, constant or intermittent pressure pains, reflex neuroses, hay fever and asthma (hyperesthetic rhinitis).

To avoid repetition and to further elucidate the subject, the above conditions will be further discussed under the subject of economics.

In many cases the application of nasal hygiene is dependent upon the removal of pathological conditions, and for its perfect maintenance, surgical interference is often necessary. A good hygienic condition of the nose is maintained by first restoring the nose to the dignity of a respiratory organ by medical or surgical means, after which we must dispose of the abnormal secretion and debris from the nose by flushing, coaxing the secretion back into the throat and expectorating or swallowing the same or expelling the secretion by blowing the nose. The disposition of the secretion expectorated or blown from the nose is both hygienic and economic—hygienic, in that infection is liable to spread to individuals and animals; economic, in that the capacity of the individual and his relation to society are altered to the detriment of the common weal.

Under exceptional circumstances, for the maintenance of good nasal hygiene, a suitable mask should be worn, which prevents, as far as possible, the entrance of any form of dust.

Gases possessing bactericidal properties are usually irritating and in consequence alkaline and mildly antiseptic sprays are indicated.

In the ideal state paper napkins will be used for secretions or fluids from the nose either by blowing or expectorating, which will be incinerated at once. This method of using paper napkins is in vogue with the Japanese, who, as a nation, are the cleanliest people from a sanitary standpoint, and worthy of emulation by the nations of the Occident.

Whether or not secretions shall be sucked back into the throat and swallowed, or expelled by the nose and mouth, is a question worthy of discussion. Under normal conditions, the normal secretion should be swallowed, and since the body is already taxed in most individuals to the limit, that which is abnormal, and therefore detrimental to normal metabolism, should be expelled by the most expeditious route, and blowing the nose, if not esthetic, is probably justifiable and natural from the individual standpoint, but not from the standpoint of society as a whole.

The nose is also normally a resonant chamber, and as such is necessary to public speakers, singers, soldiers and sailors. However, this function is of minor importance in the case of artisans, mine workers, printers, etc., to whom purity of voice is of no assistance in the competition of their calling.

ECONOMICS.

The study of the nose in its relation to economics leads one into the domain of legal medicine. The two subjects have a definite connection.

Neither the profession nor the industrial world has any fixed conception of the part which the nose plays in economics, but it may be expected that such ideas will be developed as we come to know more about the question of liability and damages as between employer and employee in the various occupations.

The law as it operates now, holds certain corporations directly responsible for injuries to employes, but provides no special rule for assessing damages in an economic sense. This applies particularly to common carriers, amenable to interstate commerce regulations.

These matters of dispute must be eventually settled by equitable legal enactment, and in the settlement the evidence of the rhinologist must play a conspicuous part, since, as we shall show, the condition of the olfactory organ has a very direct bearing upon the earning capacity of the individual in certain occupations.

In consequence of responsibility placed upon employers, more rigid physical examination of applicants should be required. It is my duty to call attention to the influence of certain nasal defects

upon the earning capacity of the individual, and to the influence of nasal disease in predisposing to traumatic disease or to injury. I also want to call attention to the necessity of a more careful inspection of the nasal organ before allowing applicants to engage in any occupation demanding a normal physiological nose, and shall endeavor to point out certain occupations in which this examination is indicated.

We cannot conceive of any profession or trade in which normal physiological function of the nose does not influence the earning capacity of the individual. The amount, however, may vary in individuals, and the loss of any one special function may be of far greater economic significance in one class of individuals than in another.

Under respiration, we shall keep in mind conditions which may arise from fracture of the nose, pressure, nerve irritation, supuration of the sinuses, hypertrophy, hyperplasia, adenoid vegetation, deflection of the septum, flat nose, and all conditions causing faulty aeration of the nose with corresponding economic loss.

Fracture of the nose may involve the nasal bones, septum, cribriform plate, and the nasal process of the superior maxillary bone. Fracture is due to some form of traumatism, but conditions may arise which predispose to fracture, which should be taken into consideration in assessing damages. Under normal conditions, a slight blow upon the nose would not produce a fracture; however, should the individual be suffering from a weakening of the bony or cartilaginous structures from syphilis, fracture might occur with the slightest blow, thus reducing the responsibility of a corporation to the minimum. Meningitis, nasal stenosis and nasal pressure, any one of which may be of sufficient importance to partially or completely disable the victim, are among the sequelae of fracture or traumatism of the nose.

Mouth breathing in children is usually due to abnormal or diseased adenoid tissue and enlarged tonsils, deflected septum, or hypertrophied lower turbinated bodies. The ill effects of mouth breathing due to hypertrophied tissue in the vault of the pharynx upon the physical and intellectual growth of the child, are narrowing of the nasal chamber, arching of the hard palate, mandibular deformities, respiratory disturbances, Balnes cough, which is a nocturnal, spasmodic cough upon lying down, chest deformity, aprosexia, faulty metabolism with a predisposition to infectious diseases, rheumatic affection, and many nervous symptoms, such as Sydenham's chorea, as pointed out by Leopold de Ponthiere.

The sequential pathology of mouth-breathing due to adenoid tissue and tonsils is not so well known. Mouth-breathing from deflected septum has fewer general symptoms than that due to adenoidal hypertrophy.

The results of mouth-breathing from adenoids are well known and are practically as above enumerated. The exact pathology of the metabolic changes, both in the nervous and general system, has not been altogether satisfactorily explained.

There is evidently in the body of most children suffering from adenoidal hypertrophy and mouth-breathing a nutritive change, and, to use the phrase of Sajous; a want of "auto-protective or immunizing substance" in the blood. That the child does not get sufficient oxygen to aerate the blood is hardly a sufficient reason alone to account for all the metabolic changes in the absence of infection. It may be, as stated by some writers, that in addition to harboring micro-organisms, the diseased adenoid secretes a toxic substance akin to that secreted by the diseased ductless glands of the body, which is carried through the lymph streams and into the blood. A substance may be excreted from the abnormal gland, which when mixed with the nasal and oral secretions and taken into the gastro-intestinal tract, produces sufficient disorder to account for some of the symptoms. On the other hand, the gland may, in children, secrete a substance which is of value in metabolism, and when this function is lost, atrophy begins.

It is difficult to estimate the number of school children suffering from defective nasal breathing, since so few cities have a systematic medical inspection of schools. Among these few are New York, Philadelphia and Chicago, and recently Indianapolis, by act of the Legislature.

In a pamphlet published by the Department of Health of New York City, we find that in examination of schools 141, 160 and 168, with an enrollment of fifteen hundred students, fifty-nine per cent have defective nasal breathing; the exact pathological conditions, however, are not indicated. The conditions which appear most prevalent in order of frequency are defective teeth, enlarged glands, hypertrophied tonsils and adenoids. We are unable to arrive at the amount of time lost from school work and to compute the economic loss. The educational features of school inspection must be of great economic value to the community in instructing parents in the cause and prevention of disease.

In Philadelphia of the one hundred sixty-three thousand, nine hundred and sixty-nine school children seen daily by the medical inspector from September, 1907, to June, 1908, two hundred and

ninety-six were dismissed from school on account of tonsilitis and one hundred thirty-three on account of coryza. The following number were recommended for treatment: Six thousand, seven hundred seventy-two, for hypertrophied tonsils; six hundred eighteen for rhinitis, and four for ozena. Of the two hundred ninety-six excluded for tonsilitis, it is reasonable to presume that probably most of them suffered from a postnasal inflammation, in many cases preceding, or being the exciting cause of the tonsilitis. It is also reasonable to presume that of the children recommended for treatment for hypertrophied tonsils, fifty per cent were mouth-breathers.

According to Dr. A. C. Abbott's report in a personal communication, the average loss of each child from tonsilitis was 5.9 days, or 1,746.4 school days; from acute coryza, 4.3 days, or 571.9 school days. This data is sufficient to give us a working knowledge of the number of school days lost, and the following is a very fair average of the number of days lost from each of the following diseases: Simple angina, 3.2 days; pharyngitis, 3.5 days; rhinitis, 4.2 days; ozena, 5.8 days.

Dr. W. A. Evans, Commissioner of Health, Chicago, sends me the following report for the year 1908:

Number of physical examinations.....	45,265
Number requiring treatment.....	21,039

NATIONALITY OF THOSE REQUIRING TREATMENT.

Native born.....	20,593
Foreign born.....	1,924
One or both parents foreign born.....	16,434

DEFECTS FOUND.

Nutrition	1,148
Anæmia	1,421
Enlarged glands.....	5,843
Nervous diseases.....	252
Pulmonary diseases.....	205
Nasal breathing.....	1,751
Palate	13,838
Hypertrophied tonsils.....	9,446
Adenoids	1,654
Mentality	450

In the State of Indiana, the cost for public instruction for each child from the age of seven to fourteen years is about three hundred dollars, or fifty dollars a year. The economic loss from imperfect work and loss of time incidental to faulty cerebration and diseases directly due to the nose must be very great, and should the child die at the age of fourteen years from some disease having its atria of infection in the nose, the State has lost three hundred seventy dollars, or the value thereof, for education alone.

We might go further and say that our whole public school system contemplates the mental, without due consideration of the child's physical, capacity. Both teachers and students in our public schools are overworked. The whole system of public school education is constructed by men advisedly unable to judge the student's physical capacity to undertake an ideal course of study. As the physician's knowledge is necessary in judging the relation of disease to the earning capacity of individuals, so his knowledge and advice are necessary in judging the physical and mental capacity of the child for any scheme of educational instruction.

The value of a human life is regarded by the courts at nominally five thousand dollars, and in the year 1907, in the United States, we had the following number of deaths from diseases of the nose and meningitis other than traumatic, a disease which most observers believe more often has its atria of infection in the nose. These statistics were taken from 48.8 per cent of the total population of the United States, and represent the rate per hundred thousand:

Diseases of nasal fossa.....	85	.2
Meningitis	11,109	26.6
Meningitis (simple or unqualified).....	7,365	17.6
Epidemic cerebrospinal.....	3,744	9.
Tubercular meningitis	4,062	9.7

From these statistics it is easy to compute approximately the economic loss by death from diseases of the nose, or with the nose as the atria of affection.

Intranasal pressure or head pains from deflection of the septum, specific or non-specific hypertrophy or sinus suppuration, and their influence upon the economics of the individual, are very apparent to the rhinologist, appreciated by the oculist and a few, but not many physicians, and not at all by the public. The points of irritation observed in head pain are more often the region of Meckel's ganglion, anterior prominence of the middle turbinate, lower turbinated body and the nasal process of the superior maxillary. This irritation may be due to hypertrophy alone, with or without contact and pressure upon deflected septum. Headache from intranasal pressure may come on at any time in life, but we think is more often observed in women than in men. The pain is usually unilateral. The amount of pressure or hypertrophy necessary to produce head pains is, in many cases, very slight. We have observed a few cases in which distinct pressure was observable in the anterior middle turbinal region, in which the pain disappeared with cauterization of the anterior portion of the middle turbinate with nitrate of silver, 60-90 grains to the ounce of water, though the amount

of edema would apparently change but little. Frequently persistent unilateral headaches have responded to cauterization of the lower hypertrophied turbinate, in which no evidence of pressure could be detected. Pain of this character is possibly due to increased blood pressure or hypertrophy and exceptionally to angioneurotic edema. It may also be due to local or general faulty metabolism, which may be chemical, bacterial or physical, and directly influences the vasomotor system. These pains, which may be due to syphilis or some general toxemia, frequently react to constitutional treatment alone, though pressure may be apparent upon ocular inspection. Pain in the fronto-temporal and fronto-nasal regions and behind the eyes is more often due to intranasal pressure from the deflected septum or hypertrophy of the turbinates than to sinus suppuration. Pain in the mid-orbital region is indicative of frontal sinus involvement or inflammation of the supra-orbital nerve. Pain in the nasolabial region frequently occurs from irritation of the floor of the nares. Pain in the tonsil is often referred to the thyroid cartilage and middle ear. The pain of maxillary sinus disease is usually about the sinus. Constant or periodical headaches usually incapacitate the individual for all forms of work during the time of seizure. The treatment of headache from intranasal pressure is as yet somewhat empirical.

The physiological function of olfaction is for the detection of odors, and under hygiene of the nose we discussed the reason for this function. The discussion of those substances possessing odor and their classification is essentially a part of economics. Many odorific substances are the direct product of nature, while others are the work of chemists. The following classification of odors given by Havelock Ellis, is the one adopted by Zwaardemaker, and is founded upon the ancient scheme of Linnaeus:

I. Etherial odors (chiefly esters; Rimmel's fruity series).

II. Aromatic odors (terpenes, camphors, and the spicy herbaceous, rosaceous and almond series; the chemical types are well determined; cineol, eugenol, anethol, geraniol, benzaldehyde).

III. The balsamic odor (chiefly aldehydes, Rimmel's jasmin, violet and balsamic series, with the chemical types; terpineol, ionone vanillin).

IV. The ambrosiacal odors (ambergris and musk).

V. The alliaceous odors, with the cacodylic group (asafœtida, ichthyol, etc.).

VI. Empyreumatic odors.

VII. Valerianaceous odors (Linnaeus' *Odores hircini*, the capryl group, largely composed of sexual odors).

VIII. Narcotic odors (Linnaeus' *Odores tetri*).

IX. Stenches.

In a specific class of professional or wage workers, the loss of olfactory sensibility may entirely incapacitate the individual for work and render his ability to compete in a specific line of work almost nil. Consequently in the assessment of damages for such a loss, we would have to take cognizance of the training of the individual to this kind of work alone, and the chance of his competing in other lines as well. A partial loss of olfaction would probably not affect the individual's earning capacity, which would presumably vary with the amount of olfaction. Many individuals engaged in the manufacture of irritating volatile or gaseous substances continue in this line of work. However, some men, especially workers in musk, according to Ellis, have a tendency to dementia præcox, thus becoming totally disabled and often a charge upon the State.

Among the workers especially demanding good olfaction are physicians, railroad employes, especially motive-power men and watchmen, aeronauts, motor-car drivers, artillerymen, workers in high explosives, chemists, cooks, policemen, firemen, sanitary inspectors, mine workers, marine employes, employes in gas, acetylene gas and waterworks, tobacco works, perfume works, bartenders, professional tasters and leather and shoe buyers.

We might point out the different conditions under which the above classification would require perfect olfaction, but for want of time we will limit our observations to the necessity of olfaction in individuals employed in railroad service.

From personal observation of men in the railroad service, we are of the opinion that it is time special examination should be extended to include not only the eye and ear, but the careful examination of the nose and throat as well. Enginemen and stokers can, by the sense of smell, detect the different varieties of oil used about an engine. In the absence of smell, these men are compelled to pour oil out upon a surface for ocular inspection, depending upon this and the sense of taste for the differentiation of coal oil and lubricating oil. It may seem somewhat far-fetched to say that a great deal of oil is thus lost and a certain amount of unnecessary expense added.

But to go further and cite other instances in which a greater expense may result, I will say that it is impossible for an engine-man suffering from loss of smell to detect friction odors, a hot journal box, or for a trainman to detect a hot box other than by sight, and possibly, in extreme cases, a fire in some part of the

train, either in motion or standing. For instance, a few years ago on the St. Louis division of the Big Four Railway, a moving passenger coach took fire from a hot box. Passengers in the coach detected the burning odor and called the brakeman's attention to it, but he reported that he could detect no odor and dismissed the subject. A short time afterward the conductor came into the coach and verified the presence of odor, and upon investigation the coach was discovered to be on fire. Examination of the brakeman afterward showed that he was suffering from atrophic rhinitis and anosmia.

THE SOCIAL, HYGIENIC AND ECONOMIC ASPECT OF THE EYE.

DR. PERCY FRIDENBERG.
NEW YORK CITY.

Had I known that my address was to be delivered before this assembled society, instead of in the comparative seclusion of the Section on Ophthalmology, I should have entitled it "The Relation of the Specialist to the Community," but what I have to say applies, I think, to every specialist, to the rhinologist and otologist as well as to the oculist.

The physicians who have intensified their work and have been at the pains of acquiring particular knowledge of a small field, must not use that knowledge merely as a sword in the struggle for position, but a trust fund, to be used for those who have most need of it. Advance in medicine throughout the ages has been on the one hand material and technical—means or methods of diagnosis and treatment, discoveries of drugs and inventions, operations or of clinical tests,—and on the other hand a progress of the spirit, a recognition of and striving for the ideal, the goal of all medicine. So we see the medical man developing from the priest, the magician, the soothsayer and becoming a student and a teacher, and a philosopher, a co-ordinating and regulating center of many spiritual and practical activities, a scientific man, a member of a large social organization, co-operating with what the old medicine would have called "laymen," but whom we today recognize as our assistants in one of the greatest tasks medicine has, the preservation of health and the hygienic education of the community. And today it is not the family doctor alone, but the teacher, the engineer, the legislator, the social student and the business man with whom we have to work hand in hand, to each of whom we have to give respect for special knowledge, trained experience, ability and public spirit, and whom we should be ready to support with our own knowledge when the time comes. The community must work for the good of the community, not individuals for individuals.

I have been interested and amused rather than uplifted in reading the books that come out from time to time depicting the possibilities of a future Utopia, and it has struck me that these books deal almost exclusively with mechanical improvements, or with wonderful advances in the science and art of killing, by

which men are to be put to death in legions by wonderful explosives and cities wiped out by huge engines of destruction. It has seemed strange to me that no one has considered the Utopian possibilities of the healing art, of hygiene and of sanitation in relation to the happiness and welfare of the race.

This symposium deals with the use of the specialist for the benefit of the community; not only in the prevention and cure of disease, but in the training of those who are to help us, and in the future these agencies will be so numerous, well organized and usual that we will wonder how people ever got along without them. We are only touching the possibilities in taking, for instance, the one detail of the Eye and Ear Hospital. I do not think that the full scope of the eye and ear infirmary has ever been formulated as yet. It must of course be devoted to the cure of disease and the care of the sick, but it should aim also at the prevention of disease and of blindness by infection, injury or dyscrasia, with which all this implies for the recognition of causes and their treatment. There must, therefore, be training schools for nurses, surgeons and patients. We must care for the educational as well as for the merely medical side. This is absolutely essential if the work is to be disseminated and spread as it should be. Otherwise, we are merely individuals, each attending to his handful of patients, teaching the individual, giving advice to the individual, whereas that advice should be systematized, syndicated, spread wide, given to the general practitioner, the student, and even to the masses in such a way as to be of most widespread and immediate benefit. Post-graduate schools for eye and ear should be devoted not only to the instruction of medical men, but to teachers, engineers, architects, so they may learn what is needed to preserve the eye health of the community. Let us learn from them the difficulties which confront the architect and engineer. Let us learn also from those who instruct the blind. The oculist must be in a position by practical training to advise the mother whose child is blind how to rear that child and how to have it taught when the time comes. It is a reproach if he knows nothing about that training, as it would be a reproach to the teacher to know nothing of the medical side of this grave and important question.

One thought that has occurred to me with regard to the teaching duties of the specialist is that this teaching, with the example of incentive and personality, must be given not only to the general practitioner, but, most important of all, to the generation

of oculists or of otologists which is to follow him. I said before, and I believe, that whatever special ability a man may have attained is a trust fund and not a private possession. It has been given to him by others gladly and in many cases freely bequeathed in the fullest sense, and as he has learned from those who have gone before, it is his duty to pass it on to those who come after. If a man through selfishness regards his skill as something he should guard and keep secret, as a badge and distinction, or as anything but a lamp to be handed on, he is untrue to the profession which he represents, faithless to the community, lay and professional, in which he lives and thrives.

Our own surgical skill and operative judgment comes through experience mainly, and that comes from actual practice. The younger man looks to his superiors in experience and in ability to make him their equal by teaching, supervision, and, most of all, by opportunities for practical work, and the opportunity is a great one for the man who has had his start and his chance, to build up a school to perpetuate his skill, to increase his fame, to add to merely specialistic ability the name of a great teacher, and that means a great benefactor. The young men who come into the clinics as assistants or into the infirmaries as members of the house staff, must be sent out trained and ready to do that work, not only with theoretical knowledge, but with broad views and high mechanical skill, ideas such as our president has outlined in his address, the idea that the specialist is in the service of the community, and that there are many important questions which he can solve or help to solve, and that his effort must be directed not only toward treating the individual, but to teaching him to help others to treat the community.

DISCUSSION.

CHAIRMAN:—We are specially favored in having present several gentlemen, all residents of New York City, who are more than qualified to open this discussion, and I take great pleasure in asking Dr. Luther H. Gulick of New York City, director of physical training in the New York schools, to open the discussion.

DR. GULICK, New York:—For several years I was director of physical training, but am not at present.

No living man is competent to open this discussion, for to discuss the social, economic and hygienic bearing of all our organs is to discuss the bulk of human progress, and the diversity of the point of view of those who have read the several essays indicates the tremendous extent of the ground which is covered by the topic. I will select three or four points rather than make any attempt to discuss the subject in full.

First, Dr. Kyle refers to mouth breathing. I started in my work with the assumption that the nose was made to breathe through, and attempted

to train men to run by breathing through their noses and not their mouths. No man I ever attempted to train for running for distance ever became able to run well with the mouth closed. I have since studied the best runners in the world, and have never found an Indian, a black man, a white man or a yellow man who could run a distance and keep his mouth closed. I believe the best runners in the world are wolves and dogs, who keep their mouths open. I believe the process of metabolism involved in the great muscular labor of running has a connection with the body weight. Animals who have large nostrils in proportion to body weight, as the deer, are able to carry on the exchange between the gases rapidly enough; but in animals in which the nostril is small in proportion to the body weight, as in the human being, dogs and wolves, I believe it is necessary and wise to breathe through the mouth in order to get enough oxygen and carbon dioxide. This is not a defense for habitual mouth breathing, but let us not attack this phase of it which is beneficial when extreme long continued exercising is involved.

I was extremely interested in the scholarly paper of Dr. Blake, and his reference to the concentrated attention in those who attempt to listen, having defective hearing. The major difficulties of defective sense organs I do not believe are to be found in those in whom these difficulties are most evident, but in those persons having a minor degree of difficulty, who are able by extreme attention to overcome most of these difficulties; those who, with defective hearing, by listening hard enough, by constant thinking of the context, as Dr. Blake suggested, are able to keep up. Bright children in many cases; children with defective hearing, who, by trying very hard, and straining as we all do when we read in the nearly dark, can accomplish with these forms of fatigue which are far more deleterious to the organism than are any of the disabilities coming directly from deformities of the eyes or hearing. The results of constant, extreme endeavor are among the chief enemies of human endeavor. I have known many children who have passed on in school, doing satisfactory work with unsatisfactory organs of vision or hearing, and who broke down in consequence of a large amount of concentrative attention, and in nearly all cases the diagnosis was made of over-study; and it was so in one sense, the over-attention required by the deficient organs.

I was tremendously impressed some years ago when in relation to the health of the public school children of New York City, from the standpoint of the Board of Education as to the findings of the Board of Health with reference to troubles with the eye, ear, nose and throat, and their statement that a large fraction of all the backward children in our schools were so because of physical defects, and it seemed to me that the thing was of such tremendous economic and hygienic importance that we ought to find out whether it is so or not, to take a large number of cases of which we had long records. An application to the Sage Fund to carry out such research was successful, and to the public schools for the records, was successful, so I had recourse to twenty thousand children in New York City. If a school was selected, every child in the school was considered, and in these twenty thousand children it did not appear that physical defects are in any sense the major factor in producing backwardness among school children. It was a curious anomaly. In the Fifth grade, for example, the older children in that grade had fewer defects than the youngest child in that grade. Is that clear? In the Fifth grade, the older the child the fewer defects they have. Of course we know that we outgrow defects with age, but defects are nothing like as injurious to progress as are irregular attendance and lack of patience

in doing the work, and this is a caution to those of us who have been arguing that nearly all the ills of the school system are to be remedied by adequate inspection.

Since then I have carried out a study of those sixteen thousand children who graduated from the New York City schools last spring. That shows the same general facts, which will be published later.

It seems to me that the thing for us to do with reference to the eighteen million school children in the United States, from the standpoint of the social bearings of the eye, ear, nose and throat, is to see to it that through the intelligence of the parents children are allowed to grow up with the freedom that comes from the ability to use the voice and vision well. Too much of the medical inspection now carried on consists of diagnosis and nothing further. We must carry out in the American cities some scheme by which, having made the diagnosis, the treatment must follow, so the results will actually come to the child, and then we will have better conditions than obtain now.

DR. FERNANDEZ, Havana, Cuba:—It is indeed a great honor you confer upon me in asking me to speak on a subject so well presented by the members who have spoken.

I will limit myself to saying that frequency of nasal catarrhs in relation to ocular catarrhs have been in but a few instances observed by me. This, in Cuba, can be explained by the absence there of the winter season, for it is in that season, as is well known, that catarrhs of the mucous membrane develop with greater frequency in the temperate and cold climes.

MR. L. B. MARKS, New York City:—It is with some little trepidation that I appear before a meeting of doctors to discuss the question of the effect of light on the eye. I will take but a few moments of your time to allude to some phases of the engineering side of the subject.

With the growing use of light, sources of great brightness, such as the tungsten lamp, for instance, the strain on the eye becomes greater and greater, and we are, if anything, becoming more prodigal of our eyesight. It seems to me that it is the duty of the oculists to take the upper hand in educating the public in the proper use of artificial lights. One of the most important phases of the subject is the question of the intrinsic brightness of the light source. I have had the pleasure of being present at the birth of two children, and feel that it would be a great blessing to have some of the results of the observations I then made on the lighting question looked into by those who are more competent than myself to study these matters. The newborn babe lies with its eyes facing the ceiling. The first few days it makes no use of its eyes, but afterwards at night—in the houses of our millionaires as well as in the homes of the poor—it often faces lights that have an intrinsic brightness of over a thousand times that of daylight illumination through a ground glass window. The intensity of the illumination of the unshaded incandescent light is simply enormous compared with that of the diffusing surface of such a window. Now I ask you, what is the effect of this on the eyes of a newborn child? From infancy to old age our eyes are subjected to the high intrinsic brightness of inadequately shaded and powerful artificial lights. Lately the flaming arc has come in, and soon the "quartz" mercury arc, which is not yet in use in this country but is being used abroad, will be introduced here. The "quartz" light has a still higher intrinsic brightness than any of the others.

We must diffuse and direct our lighting. Where shall we begin? One lesson in Dr. Gulick's remarks, I think, leads us to look to the school room. The illumination of some of the public schools in New York City

I think is a disgrace. I have tried to bring this to the attention of the school authorities, but without results.

In attempting to formulate good illuminating engineering practice, we are up against a stone wall in almost every direction; not because there is no desire to co-operate with us, but because there is an apathy on the part of those whose co-operation is necessary to success. There is an apathy on the part of the architect. There is an apathy on the part of the engineer himself. There is an apathy on the part of the oculist.

In making an investigation recently for a factory I found that a great deal of the difficulty with the eyes of the workmen was due to reflected light. The facts were these: The direct reflected light (glare) from the object which the operator was viewing was over ten times as great as the direct light that would be needed to adequately illuminate the object. There was a "power" effect on the eye, coming not from the source of light, but from the illuminated object. I took up this subject for the New York Public Libraries and designed the lighting for the new Carnegie branches, with a view to cutting down the deleterious or harmful reflection of light from the books and pages viewed.

I want to make a plea for co-operation. While President of the Illuminating Engineering Society, which is a national body, I had the good fortune to interest a few oculists in our work. A joint meeting was held with them and the engineers profited greatly from the discussion. Very little further has been done, so far as I know, to bring about co-operation between oculists and illuminating engineers. I come here with the plea that you tell us something about our work, about your side of it, and let those of us who are commissioned to design the illumination of our schools, our libraries and our factories, learn how to apply some of the experiences which you have gained in your own work.

CHAIRMAN:—One more gentleman I would like to call upon, and I know we would be delighted to have a few remarks from Dr. W. S. Scripture of the College of Physicians and Surgeons, who has made a special study of the voice and voice defects.

DR. SCRIPTURE, New York:—Your chairman has been kind enough to ask me to say a few words. Many patients come to the clinics who are troubled with various forms of defective speech, such as lisping and stuttering. Many of the lispers can be readily helped. The principal trouble is that they use a "t" or a "d" in place of an "s" or a "z". It is necessary to have a groove along the middle of the tongue to make the hissing sound of "s". These patients press the tongue too tightly against the top of the mouth and close the groove, thereby producing a "t" instead of an "s" or a "d" instead of a "z". By pressing a pen holder or a probe on the tongue you can produce this groove and the patient is forced to make an "s". He soon learns to do it himself. In making the sound of "th" the side of the tongue must be loose in order to let the air pass. The lisper closes the tongue tightly and makes "t" or "d". Just press the penholder over the tongue sideways and force him to make "th".

The most frequent speech defect, stuttering, is a most serious disease, both in its economic aspects and in the skill required for treatment. It often totally ruins the patient's life. I know of one boy who wanted to go to West Point. When he appeared before the commission he was told to give the command, "Fire". He said "F—f—f—shoot". He cannot go unless cured. At the immigrant station a stutterer was excluded as not able to earn a living. That reminds me of a man who was going to speak in a New Jersey town in which he was not acquainted. He took a carriage at the depot and told the driver to take him to the principal hotel. The cab

stopped and the driver said, "Get out and walk back two blocks." He was asked why he did not stop at the hotel, and he said "I couldn't say 'Whoa' at the right time." Another very sad case is that of a young man who had inherited great wealth, but who was a bad stammerer. As he was always afraid to talk, other children would not take time to play with him; so he has led a life of loneliness. He is a book worm and does not know how to get along in the world. His life is ruined, and unless this defect can be remedied his wealth and position are not worth anything to him. The lives of stutterers are usually worthless to others and a torment to themselves. Many of them feel as though they would like to die. A devout Christian woman of over forty came to the clinic one day and said, "I have come to be cured or chloroformed." There was one boy whose mother told me he used to ask her if there was no way in which he could die.

What are we to do with children having speech defects? It is out of the question to treat them in the nose and throat clinic. It requires too much time. One solution is to establish special speech clinics. When you consider that more than one per cent of the children in the town are afflicted with lisping or stammering, it is impossible to handle the material in any other way. There are speech clinics in New York, Philadelphia and Berlin. In Buda-Pesth, Manchester, Berlin and Brussels regular instructors carry out the work in the school. It was tried in New York last winter as an experiment. The proper method is to bring the child with speech defects to the physician appointed for this purpose in order to obtain the correct diagnosis and outline of treatment; then the treatment is to be carried out by trained assistants in the schools. I do not believe it wise to have speech classes in the schools unless each child is first seen and carefully studied by some skilled physician. The condition is similar to that of eye treatment. The specialist should see the case first and carefully go over it before the technical treatment by the optician is carried out.

DR. SAVAGE:—What do you do for boys growing up into manhood, who carry with them the young or female voice?

DR. SCRIPTURE:—The only thing for these high falsetto voices is to give them exercise in relaxing the vocal cords.

DR. C. J. BLAKE, Boston:—The importance of studying economic noises and their influence upon the human subject was taken up at the International Otological Congress at Buda-Pesth; and, at the suggestion of Prof. Grazi of Florence, an international committee was appointed to take this subject under consideration. In Italy there has been a decided protest, from the professional standpoint, against the noise of locomotive whistles, the pitch of such whistles on the Continent being much higher than that of similar whistles in this country; objection has been strenuously made to the ear-piercing sounds produced, and various authorities have been memorialized on the subject. This committee is appointed to consider the whole question of economic noise and its relationship to the welfare of the people subjected to it. The American members are Dr. A. G. Bell and Prof. Cross of the Massachusetts Institute of Technology, in addition to the President of the Ninth International Otological Congress.

Will you allow me to extend to the members of this Academy a very cordial invitation to participate in the next International Otological Congress, which I have much pleasure in saying is to be held in the Medical Department of Harvard University in Boston in 1912. It is particularly fortunate that we have the meeting of so representative a body held under university auspices, and I trust the members of the Academy will interest themselves in the work. The papers already offered from Continental

members are sufficient to insure an excellent scientific gathering, and it remains now for America to furnish its proper contingent of carefully considered scientific matter.

CHAIRMAN:—Dr. Blake is chairman of this section of the International Congress.

DR. WOLFF FREUDENTHAL, New York City:—Just as well as too much light is injurious to the eye, and too much noise is injurious to the ear, so is too much moisture injurious to the upper air tract. We have occasionally too much moisture here, but what we suffer from in New York and in most cities of the United States is too little humidity in winter. Dr. Wells alluded to that in his paper, and I want to draw attention to investigations I have made and facts illustrated in examining the air of rooms we inhabit. The normal amount of moisture ought to be 40 per cent to 65 per cent, or about that. I find that in the majority of cases we have not 25 per cent in our rooms, and this, according to my opinion, is the cause of rhinitis sicca, etc., and that disturbance we find in post nasal catarrh. In Berlin Dr. Finder and others told me that since they have there what is known as the central heating system certain forms of post nasal and dry catarrh are much more frequent than before. The solution is to introduce more moisture through our furnaces. I wish we had here engineers to give us details about that.

DR. JOHN E. WEEKS, New York City:—I think we take a step in advance when we find occupation for men who term themselves "illuminating engineers." I listened with great interest to the remarks of the gentleman who has just spoken on this subject. I think they were much to the point and very timely. One of the great faults, it seems to me, or rather one of the reasons why our buildings are not better lighted, particularly our school buildings, is that architects and illuminating engineers do not make themselves familiar with what has already been done by the ophthalmologist. This question of light has been studied for a long time and very carefully by a large number of ophthalmologists in Germany and in this country, and by those who have given it any particular attention the necessities, or rather the proper form of illumination, is fairly well understood. His argument that the school rooms in New York City are very poorly lighted—"disgracefully illuminated," he put it—is very true. A short time ago I visited a number of school buildings in this city, and in only one school did I find the illumination anything like what it should be. The lights are too low, unprotected and insufficient. The schoolhouses are built, the majority of them, with too little window space. It is well known that the window space should be one-fourth (certainly not less than one-fifth) of the area of the floor space. In artificial illuminating it is well known the lights should be out of the direct range of vision. An educational movement for the purpose of enlightening architects and illuminating engineers, if you please, would be most beneficial to humanity, and ophthalmologists might well take part in such a campaign of education.

REVIEW OF THE ANATOMY AND PATHOLOGY INVOLVED IN DISEASE OF THE ORBIT SECONDARY TO DISEASE OF THE NASAL ACCESSORY SINUSES.

GEORGE SLOAN DIXON, M.D.
NEW YORK.

Advancement in the methods of diagnosis and treatment of diseases of the accessory sinuses of the nose in recent years has caused ophthalmologists in general to take more interest in the matter, particularly those cases presenting orbital involvement.

As this subject is to be a feature of the present meeting of the Academy, I have been assigned to review the anatomical and pathological aspects involved. This will be more in the line of refreshing our memories than an attempt to present anything new.

The bony cavities of the orbits are somewhat pyramidal in shape, with their apices behind. The inner walls are approximately parallel, but the other diverge until the orbital axes are separated in front by about 60 mm., while they converge to about 35 mm. behind. The depth from base to apex is about 47 mm. in the average adult. The base or outer margins measure about 35 mm. in diameter, and are somewhat quadrilateral in shape. The capacity of each orbit is about 24 cc.

The roof is arched and formed by the orbital plate of the frontal bone and lesser wing of the sphenoid. It presents the optic foramen behind for passage of the optic nerve and ophthalmic artery, the fossa for the lachrymal gland in front to the outer side, the supraorbital notch or foramen for the supraorbital artery vein and nerve, and a depression for the attachment of the pulley of the superior oblique muscle near its inner anterior margin.

The lower wall, or floor, is directed downward and outward and is formed by the orbital process of the malar, the superior maxillary and palate bones, and presents a groove converted into a canal in front for passage of the infraorbital nerve and artery. The sphenoidal fissure is to be found behind for passage of the third, fourth, ophthalmic division of the fifth, the sixth nerves, and the ophthalmic vein.

The inner wall is formed by the nasal process of the superior maxillary, the lachrymal, the os planum of the ethmoid, and a

small portion of the body of the sphenoid behind. We find anteriorly the lachrymal groove for the lachrymal sac, formed by the nasal process of the superior maxilla and lachrymal bones; the inferior turbinated bone completes it as a canal below. The lachrymal sac is continuous with the nasal duct and communicates with the inferior meatus of the nose. The anterior and posterior ethmoidal foramina are found in the upper margin of the inner wall. They transmit the ethmoidal vessels and nasal branch of the ophthalmic nerve.

The outer wall is least important of all, surgically. It is formed by the malar and orbital plate of the great wing of the sphenoid.

This of course implies that the orbit, with its contents, lids, globe, muscles, lachrymal apparatus, orbital fat, etc., is in close relation with the frontal sinus above, the ethmoidal cells and sphenoidal sinus internally, the maxillary antrum below, and is in communication with the inferior meatus of the nose through the lachrymal-nasal duct, and that inflammation, suppuration and neoplasms in any of these cavities are liable to involve the orbital contents.

The maxillary antrum, or antrum of Highmore, is usually the largest of all the accessory sinuses, and may be described as a triangular, pyramidal cavity in each superior maxillary bone. Its base is directed toward the nose, and its apex toward the malar bone. It varies greatly in size and shape in different individuals, the ordinary capacity for each cavity in the dried bone being about 16 cc. The walls are thin except in childhood, especially the inner or nasal. As the size of the cavity increases the thickness of the walls decreases. Not infrequently thin vertical plates of bone cross the sinus below and interfere with drainage. So-called dental cysts may protrude into the cavity, with which they may or may not communicate, and one or more bicuspid or molar teeth are likely to enter the sinus.

The opening in the disarticulated bone is large, but during life it is partially closed by the thin plates of the ethmoid, palate and inferior turbinated bones, and by folds of mucous membrane till a very small opening only is left high up, allowing communication with the middle meatus of the nose.

The roof of the antrum forms a part of the floor of the orbit, is frequently very thin, and it is not unusual to find dehiscences in the dried bone in this location.

The ethmoidal cells are composed of a mass of thin walled cavities to the inner side of the orbit, exceedingly irregular, never alike in two individuals nor on the two sides of the same individual.

They are usually described as consisting of an anterior, middle and posterior set of cells, the middle and posterior having no direct communication. The posterior cells are often in close relation with the optic nerve, especially when the posterior cell replaces the sphenoid, according to Dr. Loeb. All the ethmoidal cells occasionally enter the orbital plate of the frontal, and are then termed orbital cells, and the anterior are likely to project one or more cells into the frontal sinus, when they are termed frontal bullae. The anterior and middle set of cells drain into the middle meatus, and the posterior set into the superior meatus of the nose.

The size and shape of the sphenoidal sinus in the body of the sphenoid bone is also subject to great variation. It may be relatively very large, having a capacity in the dried bone of as much as 13 cc. on each side, or it may be very small. The cavity is divided by a vertical septum from before backward, and it is the rule for one division to be larger than the other. At times it surrounds the optic foramen more or less completely. Occasionally the sinus is absent. The cells drain into the superior meatus of the nose through an opening for each side. Developmental absence of the outer wall of the sinus has been reported by Dr. Emerson of Boston.

The frontal sinus has the distinction of being even more erratic than the other. Prof. Onodi has given us a very excellent atlas covering a large number of its eccentricities, but as complete as it is we occasionally find forms which differ in detail. Occasionally the sinus is so rudimentary as scarcely to be regarded as present. On the other hand it may extend laterally as far as the great wing of the sphenoid, and separate the tables of the orbital plate back to the apex of the orbit. It may extend upward between the outer and inner tables for a distance of over 40 mm. Dehiscences occasionally occur in the floor (Packard.)

We may say that ordinarily the frontal sinus is represented by a moderate sized cell or cavity in the frontal bone on each side of a vertical septum, which should be, but rarely is, in the median line of the skull except at its base, at the root of the nose. The cells are marked externally by the nasal eminences and superciliary ridges, but prominence or flatness of the ridges are poor guides,—the largest cells may be found behind flat ridges. According to Logan Turner the cells average 31.6 mm. high, 25.8 broad by 18 mm. deep. They communicate with the middle meatus of the nose through the naso-frontal duct.

All the sinuses are lined with mucous membrane continuous with that of the nose, richly supplied with lymphatics, blood vessels and nerves.

It might here be well to recall the fact that the circular sinus surrounds the pituitary body as it rests in the sella turcica, and communicates with the cavernous sinus lying on each side of the body of the sphenoid, and consequently in close relation with the sphenoidal sinus. Further, that the internal carotid artery, the sixth nerve and cavernous plexus of the sympathetic are in the inner wall of the cavernous sinus, and that the third and fourth nerves and the ophthalmic division of the fifth are in the outer wall. That the optic chiasm lies in the optic groove on the upper surface of the body of the sphenoid. That the optic, or second, the third, the fourth, the ophthalmic division of the fifth and the sixth nerves, as well as the ophthalmic branch of the carotid artery are distributed to the contents of the orbit, and that the ophthalmic vein empties into the cavernous sinus.

The published descriptions of the interchange of lymph between the various sinuses and the orbit are very limited, but if we build upon what we know, we must reach the conclusion that there is communication between the lymph spaces of the Haversian canals, the mucous membrane on the one side and the periosteum on the other. But the main communication would be through the peri-vascular and peri-neural lymph spaces of the vessels and nerves passing from one cavity to the other, or from the vicinity of one cavity to the orbit,—for example, the vessels and nerves in relation with the sphenoidal sinus just mentioned.

The orbital contents receive their blood supply through the ophthalmic branch of the internal carotid, which is given off near the cavernous sinus and enters the orbit with the optic nerve. It then gives off numerous branches, among them the supra-orbital, which sends a branch to the diploe and frontal sinus, and the anterior ethmoidal, which also sends a branch to the frontal sinus. The orbit also receives a supply from the infra-orbital branch of the internal maxillary.

The maxillary antrum is supplied by branches given off from the infra-orbital as it passes through the canal of the same name, and the sphe-no-palatine branches of the internal maxillary.

The frontal sinus receives its supply from branches of the sphe-no-palatine, which enter through the duct according to Mosher, and the anterior ethmoidal and supra-orbital branches of the ophthalmic, as referred to above.

The ethmoidal cells are supplied by the anterior and posterior ethmoidal arteries, and the sphenoidal sinus by the external branch of the sphenopalatine.

The venous circulation is through vessels returning principally in the course of the arteries supplying the parts, the orbital veins emptying into the cavernous sinus, and the internal maxillary veins into the pterygoid plexus.

The veins of the orbit are without valves. The larger ones are the superior and inferior ophthalmic, which join to form the common, and the common empties into the cavernous sinus; but occasionally the superior and inferior reach the sinus separately. The inferior vein sends a small twig to the pterygoid plexus.

Mosher states that the compact network of veins in the mucous membrane of the frontal sinus is in direct communication with the orbit.

A small vein is referred to by Lack as passing through the floor of the frontal sinus at its inner anterior angle.

While there is no direct communication normally between the orbit and the accessory sinuses of the nose, if we except the lachrymo-nasal duct, indirect communication is established between it and the frontal through the branches of the supra-orbital and the anterior ethmoidal vessels, the venous plexus in the anterior wall of the frontal, and the vein through the floor referred to above; between the maxillary antrum and the orbit through the infra-orbital vessels, and between the ethmoidal cells and the orbit through the anterior and posterior ethmoidal vessels.

It is remarkable that the orbit is not involved more frequently, considering the limited amount of tissue separating the accessory sinuses from the orbital contents. The roof of the maxillary sinus is occasionally less than a quarter of a millimeter thick, while the os planum of the ethmoid and the other bones entering into the formation of the inner wall may be even thinner, so that nothing intervenes between these cells and the orbit but mucous membrane, periosteum and these thin plates of bone. As the os planum occasionally fails to develop, and dehiscences are sometimes found in the walls of the other sinuses, protection in these locations would be membranous only.

As a rule the floor of the frontal sinus is thicker than the walls of the other sinuses, but it is thinner near the inner angle of the orbit, and being the floor seems more liable to give way under destructive or pressure conditions, or both. The orbital recesses referred to, of course, render the orbital roof more vulnerable.

It will be quite evident to any person examining the frontal bone that these so-called orbital cells or recesses are formed in the following manner. If we accept the orbital cells as prolongations or over-development of the ethmoidal labyrinth into the orbital roof, the logical explanation of the presence of the sinus would be a similar though earlier development. As the sinus separates the outer and inner faces of the frontal, another anterior ethmoidal may push its way into it from below, p. 120, forming a frontal bulla, or it may push its way outward into the orbital roof. The ethmoidal cells behind, both the middle and posterior, may also separate the orbital plate, and each cell may be distinct, or the septa, especially the internal extremities of those anterior, may become partially or wholly absorbed, but the remains of these septa can always be found.

Permit me to call attention to the confusion at present resulting from the manner in which these cells are referred to, viz.: orbital cells, ethmoidal prolongations, frontal recesses, orbital recesses, none of which describe the condition or development found, and, as often applied, mean nothing. I would suggest a change in the nomenclature. Let the term orbital recess stand for that portion of the prolongation which extends backward over the orbit without interruption. When they are separated and it is plain that they are from over-developed ethmoids, apply the term anterior, middle or posterior ethmo-orbital cells, and if these develop into the orbital roof but a short distance, designate them as anterior, middle or posterior marginal cells.

All sorts of combinations result from this over-development, but there is one important point to be borne in mind. It will almost invariably be found, when the cells occupy the orbital roof to any considerable extent, and the septa are complete, that if a cell is present behind the one the operator has explored, there will be an appreciable separation of the orbital plates by an upright wall at right angle, but if there is no cell behind, then the two plates will be likely to approach each other at an acute angle.

I will ask your indulgence for time to describe a few specimens which are a little out of the usual.

The first is a specimen in which a frontal bulla about as large as a moderate sized frontal sinus has developed upward almost as high as the sinus itself, from which it was completely shut off. The sinus proper surrounds this cell and passes to the median line in front, and has developed outward for a considerable distance. The remains of a septum will be observed in

the outer portion of the floor of this cell, which corresponds to a septum, which is intact on the left side, separating the frontal sinus from an orbital cell.

The ethmoidal cells in this specimen are in close relation with the inner aspect of the optic foramen. (A piece of rubber tubing has been inserted into each optic foramen for the purpose of better indicating them in the slide.)

There is nothing else interesting about the specimen except that the ostia of the sphenoidal cells are very large.

In the next specimen the right frontal sinus proper is about the usual size. It is limited externally and behind by a septum separating it from a cell which has developed outward over the orbit to near the external angular process of the frontal, and for nearly two-thirds of the distance back to the apex. A second smaller cell was found toward the median line. They all drained into what appeared the opening for the naso-frontal duct below the point of junction of the septum. The middle and posterior ethmoidal are about as usually found.

The frontal sinus of the left side is considerably larger. It occupies the space corresponding to the two cells of the right side, the septum which evidently originally divided it having been absorbed half way outward from the duct. The middle and posterior ethmoidal cells correspond to those of the opposite side.

The sphenoidal sinuses are rather large, the septum being near the median line, but they pass well forward and form the inner wall of both optic foramina. (The location of the optic chiasm is indicated by a piece of rubber tubing, the two ends of which have been passed through the foramina.) The ostia are large and high in the anterior wall, and show fairly well in the slide.

The next specimen is interesting on account of the fact that while the frontal sinus proper is of moderate size, the ethmoidal labyrinth has separated the tables of the orbital plate of the frontal on both sides throughout their entire extent, in some places as much as 15 mm. There is no communication between these cells and the frontal sinuses on either side except low down in the naso-frontal duct. The right frontal has developed backward into the crista galli, causing it to have a distinctively bulbous appearance.

The right frontal sinus extends upward for a distance of not less than 40 mm. (the whole skull was not obtained), and outward for 30 mm. from the median line, where it is limited by a vertical plate of bone. Its greatest antero-posterior diameter is 14 mm. To the outer side of this sinus a large orbital cell

extends outward between the tables of the orbital plate, limited only in this direction by the external angular process of the frontal and great wing of the sphenoid, anteriorly by the outer table of the vertical portion of the frontal, and at a distance of 33 mm. back is separated from a similar though smaller cell by a thin vertical plate. The tables are separated in front a distance of 15 mm. and posteriorly by 9 mm. at the shallowest part of the cell. At the inner edge of the orbital plate this cavity opens into a large anterior ethmoidal cell, which in turn communicates with the middle fossa near, if not through, the naso-frontal duct. The opening for this cell (in the dried bone) seems to be in common with the frontal proper, but of this I could not be certain.

The smaller orbital cell above referred to has no direct communication with the cell just described. It extends entirely across the orbital plate into the lesser wing of the sphenoid behind and over the optic foramen, and terminates in a posterior ethmoidal cell internally, which in turn communicates with the superior nasal fossa.

Still farther back, but toward the median line, is a large posterior ethmoidal partially divided by a septum. This cell is in close relation with the right sphenoidal sinus and the inner aspect of the optic foramen. The balance of the inner wall and floor of this foramen is formed by the right sphenoidal sinus, which is large but not otherwise remarkable.

The left frontal sinus extends 21 mm. outward from the median line, where it is separated from a large orbital cell by a thin vertical septum, as on the opposite side. This orbital cell extends backward 30 mm. It is divided by a vertical septum incomplete toward the median line. The greatest separation of the tables of the orbital plate anteriorly, 15 mm., and the least 9 mm. at its posterior boundary. This cell drained through an opening, large in the dried bone, into the middle fossa of the nose by way of the naso-frontal duct. Behind this large cell is a smaller one which separates the tables 8 mm. and drains into the superior nasal fossa. Behind this again is a still smaller ethmoidal cell (in the outer wall of which has been cut a square opening as shown in the slide). This cell maintains the separation of the tables, and is in close relation with the left optic foramen and the left sphenoidal sinus. The latter is somewhat smaller than the right.

Occasionally a specimen will be found where a posterior ethmoidal cell has developed both backward and toward the median

line and encroaches on the anterior wall of the sphenoidal sinus. The ostium sphenoidal is then likely to be high, to the outer side, and be directed forward and inward to drain around the obstructing cell. The two specimens in point were dry, but the space between the cell and the ostium was not greater than would accommodate the usual mucous covering, so that the slightest swelling would have completely occluded the ostium. Add to this the fact that the sinus walls were thin, extended forward to the posterior ethmoidal foramen, upward and around the optic foramen for nearly two-thirds of its circumference, and we have a very excellent combination for invasion of the orbit through the nerve itself, as well as those structures in the vicinity usually regarded as vulnerable.

As to the time of development.—The orbits of course develop early. According to Turner, the frontal sinuses are developed from the anterior ethmoidal cells, make their appearance at about the beginning of the second year, and can generally be recognized as distinct cavities in the sixth or seventh year. I have found them very well developed at seven and eight years, and absent at five and one-half and eleven years. Some anatomists hold that the frontal sinuses continue to increase in size until late in life, which I think is true.

Turner says nothing about the time of development of the lateral masses of the ethmoid, but in Da Costa's Gray we find that they are undeveloped at birth and that the cells do not begin to form until the end of the fourth year. This appears at first glance to be widely at variance with Turner's statement that the frontal sinus, derived from the anterior ethmoidal cells, makes its appearance at the beginning of the second year, but the discrepancy becomes less when we find his further statement that the frontal sinuses can be recognized as distinct cavities in the sixth or seventh years.

According to Turner again, the maxillary antrum is represented at birth by a slit-like depression in the outer wall of the nose, so that there is no antral cavity at birth beneath the orbit. By a process of growth and absorption, keeping pace with the growth of the face, the antrum is complete at about the twenty-fifth year. He also states that the sphenoidal sinus is not present

Note.—I examined the skull of a negro last winter, the property of Dr. Macdonald, the sphenoidal sinus in which was the largest I have seen. The left sinus had a capacity of 13 cc. and the right 14 cc., total of 27 cc., only 5 cc. less than the ordinary antrums of Highmore. They excavated all the bone that was possible. The left invaded the pterygoid process below the level of the fossa, the right down to the fossa. The left surrounded two-thirds of the foramen, and the right sent a pocket under the foramen.

at birth, but makes its appearance in the body of the sphenoid at about the third year, and that fairly well developed sinuses have been found at the age of six.

Ordinary acute suppurative inflammation of the accessory sinuses of the nose may be due to streptococcus, pneumococcus, staphylococcus aureus and albus, bacillus pyocyaneus, bacillus coli and the bacillus of influenza. It begins with an attack on the cell by the microbic agent, whatever it may be, necrobiosis ensues, and the fight for supremacy is on. Leucocytes are attracted to the region, there is hyperæmia and swelling of the mucous membrane, and glandular secretion is exaggerated. At first, the mucus, carrying leucocytes in considerable numbers, is thick and tenacious, later thin and purulent, and as the degenerative process progresses other parts are involved unless good drainage be established, when recovery soon takes place. But if the affection becomes subacute or chronic, the mucous membrane still thicker from the accumulation of inflammatory products becomes villous and degenerated further and fills the cavity with what we know as granulation tissue. In a small proportion of cases the tissues separating the orbit become seriously involved, its vessels, thrombosed and infected, break down, pressure is added, the softened bone gives way, and there ensues either simple displacement of the orbital contents, abscess or cellulitis. The character of the displacement of course depends on the direction of the pressure. If it be the frontal sinus that is involved, the displacement is likely to be downward and somewhat outward, as the weakest part of the orbital roof is near the inner anterior angle, and it will be recalled that a small vein is present here which doubtless adds to its vulnerability. If the process begins in the ethmoidal region the displacement would be outward and downward, though it may be forward as well. Dr. Weeks informs me that he has seen two cases of diplopia and exophthalmos due to involvement of the posterior ethmoidal cells, particularly those which extend between the orbital plates known as orbital cells. The diplopia was transient but recurrent. I imagine that this might be accounted for by edema. If the displacement be due to disease of the maxillary antrum it would be upward, and from the sphenoid it is likely to be directly forward.

Retrobulbar neuritis is a possibility when the sphenoid or posterior ethmoidal cells are involved, in fact it is not infrequent, and it may occur in the course of frontal sinusitis, according to

Nelson M. Black (N. Y. Med. Jour., 6-2-06), but this combination is extremely rare.

Direct involvement of the globe is also rare, but detachment of the retina apparently due to frontal sinusitis has been reported by H. M. Fish (Oph. Rec., Vol. viii, No. 6). We have all seen infections following operations on the globe which could not be accounted for except on the assumption that the path of invasion had been through the naso-frontal duct.

Traumatism is not infrequently responsible for orbital cellulitis, the result of infection through injured sinuses.

Mucocele is occasionally referred to as invading the orbit from diseased ethmoid cells.

The tumors of the sinuses may be granuloma, osteoma, lymphosarcoma, osteo-sarcoma, endothelioma and adeno-carcinoma.

The osteomata invading the orbit are more likely to come from the frontal or ethmoidal region. The sarcomas and carcinomata may come from any direction. William H. Dudley has reported a case of adeno-carcinoma involving all the sinuses and both orbits. (Laryngoscope, '04.)

A DISCUSSION OF THE VARIOUS INFLAMMATIONS
OF THE ETHMOID BONE AS ADVANCED BY
UFFENORDE IN HIS WORK "DIE ER-
KRANKUNGEN DES SIEBBEINES."

DR. ROSS HALL SKILLERN.
PHILADELPHIA.

Prior to Uffenorde's work on the ethmoidal labyrinth, which appeared in 1907, this structure was considered only in connection with the accessory sinuses of the nose, and no particular importance was connected with it which the remaining sinuses did not share. Empyema and mucocoele were the conditions recognized, but beyond certain ophthalmic complications, the indications were practically those of the neighboring sinuses. Uffenorde, however, did not view these cells in the same light as the true sinuses. But, comparing the ethmoidal labyrinth to a sponge, and the frontal, maxillary and sphenoid to true cavities, he argued that these structures, on account of their morphological differences, could not be affected in the same manner, or at least would not present the same symptoms and conditions when affected.

The ethmoid, he contends, occupies a peculiar position among the accessory sinuses of the nose. It forms quite a considerable portion of the lateral sinus boundaries, presenting a complex and irregular structure. Why, then, shall not this structure react in the most vigorous manner against the many noxae which the inner nose encounters? Moreover, the structure of the mucous membrane here is exceedingly tender and loose, which also reacts in a special manner. If this mucous membrane in acute inflammation exhibits polypoid swellings, why shall true polypi not occur under the influence of continued irritation, presupposing that polypoid swelling is but a forerunner of polyp formation, both being classed under inflammatory hyperplasia?

After investigations extending over a period of some years he divided the diseases of the ethmoid into:

1. Acute inflammation.
2. Chronic inflammation: (a) ethmoiditis hyperplastica cum polyposis, (b) ethmoiditis suppurativa.

Of the chronic inflammations, the one by far the most common and least recognized, at the same time presenting the most varied and complex symptoms, was that of ethmoiditis hyper-

plastica. This disease is caused by repeated and prolonged irritations (frequent attacks of coryza, influenza, long exposure to dusty surroundings, etc.), and is always confined in the beginning to the body of the ethmoid capsule, being characterized by polypoid swelling of the mucous membrane in the basal cells, the extent of this swelling and number of cells affected depending upon the degree and length of time the irritation was directed against the parts. This inflammation (polypoid swelling) spreads through the various cells of the labyrinth without regarding the ostii. In other words, as the mucous membrane of these cells is so intimately connected with the periosteum and bone that it practically forms an anatomical unit, the inflammation goes over from one structure to the other really by continuity, so that this polypoid inflammation will appear in a cell entirely closed from its diseased neighbor as far as an ostium is concerned. The appearance of polypi or polypoid swelling in the nose proper will depend entirely on the position of the middle turbinate. If this structure lies close against the lateral wall of the nose (normal position), the ordinary rhinoscopic examination will disclose nothing abnormal unless the disease has progressed for a long period of time, in which case the middle turbinate will show pathological changes. As the basal cells of the capsules are always the first ones affected, and are the first to show pathological changes, unless these are brought into view, the entire process will remain undisclosed.

This can only be accomplished by the so-called rhinoscopia media of Killian, in which the middle turbinate is fractured at its insertion with the ethmoidal capsule, whereby the bulla ethmoidalis and base of capsule are brought into view. After this procedure, by visual inspection and by the sound, one can always accurately determine whether this body is diseased, as the irritation invariably comes from the inspired air, it naturally attacks primarily the basal cells, therefore the floor of the ethmoid capsule is the first to show pathological changes. It is impossible, however, to judge the extent of the disease by mere inspection, as the confined conditions of the middle nasal passage are not propitious for the growth and retention of large polypi (polypi being merely considered as an aggravated form of polypoid swelling). It is important to recognize the normal mucous membrane of the ethmoid and differentiate it from the diseased. The normal mucous membrane covering the bulla, outer side of middle turbinate and processus uncinatus is extremely thin and of a grayish red color; quite different from that of the septal side

of the middle turbinate; that of the processus uncinatus being sharp and well defined. One can easily differentiate it from the pathological with the help of the sound, an instrument which cannot be dispensed with in these cases. If the floor of the ethmoid capsule shows a constant swelling, one can safely consider that some portion of the ethmoid labyrinth is diseased. Opening the most dependant portion of this capsule, making an autopsy in vivo, as it were, will confirm our diagnosis.

Uffenorde also believes that chronic inflammation of the ethmoid with the formation of polypi, has per se nothing to do with empyema, but that it (hyperplastic ethmoiditis) is purely a simple catarrhal inflammatory change which takes its origin from the same noxa or noxae that cause general catarrh of the respiratory mucous membrane of the nose. Individuals suffering from this condition exhibit a marked tendency to "catch cold," during which period the secretion changes from a thin serous watery consistency to one of purulency, only to return to its original consistency after the suppurative stage of the coryza has disappeared. These symptoms must not be confused with those which occur in acute exacerbations of chronic empyema. With latent empyema all secretion is frequently absent, a circumstance never occurring in chronic hyperplastic ethmoiditis. Such cases of hyperplasia of the ethmoidal mucous membrane are often falsely diagnosed rhinitis vasomotoria, hay fever, etc. In these cases symptoms of nerve irritation coupled with a watery secretion often predominate. The hyperplasia of the ethmoidal membranes are frequently entirely hidden by the middle turbinate and remain absolutely latent, but on the other hand polypoid hypertrophy and polyp formation may, on inspection, be quite pronounced.

ACUTE INFLAMMATION.

This is characterized by a more or less pale edematous swelling of the mucous membrane which can assume large proportions. This condition occurs chiefly on the middle turbinate, processus uncinatus and bulla, and may take on a polypoid character which in the course of a few days can subside and return to normal so that the next examination presents a totally different picture. Sub-epithelial hemorrhages and engorged capillaries appear here as in the diseased mucous membrane of the other sinuses.

Acute inflammation may also be purulent from its onset, especially in the acute infectious diseases (influenza, scarlet fever,

diphtheria, etc.). In this case the rhinoscopic examination presents a different picture. In addition to the purulent discharge the mucous membrane is swollen and deeply congested. These cases occur quite frequently, but usually subside after the very acute stage has passed; for, generally speaking, the drainage conditions are better in the ethmoid than in either the frontal or maxillary sinuses. The possibility, however, of orbital and cerebral complications is by no means precluded.

SYMPTOMS.

By far the most important symptom is the headache, which can assume every possible grade of intensity, but especially taking on a sense of heaviness, coming on in paroxysms. This occurs particularly over the parietal and occipital regions in conjunction with lancinating and burning pains above and below the orbit, but especially over the root of the nose. Ocular manifestations, such as epiphora, weakness of vision, and especially on reading by artificial light, and scintillations occur. Ciliary and orbital neuralgia and in severe cases dizziness and vertigo may be present.

CHRONIC INFLAMMATION.

Speaking of this form of inflammation, one must bear in mind that many cases of chronic sinus disease run their course without any trace of polyp formation, and on the other hand many cases of profuse polyp formation have occurred without any symptom of empyema. There remains, then, the combined process, polyp formation in the ethmoid with the purulent secretion. We consider the purulent process in these cases as a secondary infection, therefore accessory. One of the best criterions as to the correctness of this opinion is the pathological condition of the inferior turbinate. In this body, with suppurative ethmoiditis, one always finds atrophy, while with ethmoiditis hyperplastica, hypertrophy of this body is the rule.

Referring briefly to the histo-pathology of the polyp and its relation to the underlying bone, Hajek demonstrated that the periosteum of the middle turbinate extended down into the medullary bone spaces, thereby meeting and joining the endosteum, in many places, forming an anatomical unit. As the inflammation attacks the periosteal structure, it is easy to conceive how readily the endosteum can become infected without regard to the cell ostii. We must therefore accept the theory that the inflammation spreads by continuity rather than by the infection resulting from the purulent secretion when present, which may trickle over and

bathe the parts. This is also proven by the fact that the maxillary sinus may act as a reservoir for the frontal for a long period of time without becoming affected. Mucous polyps grow only in the line of least resistance, therefore if the basal cell of the ethmoid is the first to experience the irritation and consequent inflammation, it depends entirely upon the position and relation of the middle turbinate to the lateral wall of the nose, how much of the diseased process we can observe by anterior rhinoscopy. In those cases in which the middle turbinate lies close against the lateral wall of the nose, even after it has been infracted, the appearance of the base of the ethmoid capsule will not give us a definite idea of the extent of the disease, because there was not sufficient space for the polypi to become prominent. And, if the disease has progressed for a long period of time, the hyperplastic inflammation will be found in the superimposed cells. These cases present unmistakable subjective symptoms, such as profuse watery secretion, intracranial pressure, lancinating pains over the eyes, pharyngitis, laryngitis and asthma. The severity of these symptoms depends largely upon the neurotic condition of the individual as well as on the extent of the disease, as in certain instances only the most dependant cells are affected, while in other instances the mucous membrane of the entire labyrinth, and even the sphenoid sinus, has become polypoid degenerated, the severity of the symptoms being about the same in both instances.

Why is a purulent secretion and often a true sinus empyema present in these cases?

When we recall that the polypi springing from the inflamed mucous membrane can become so numerous as to occlude the middle and superior nasal passages, it is easy to conceive how the ventilation and cleansing of these passages through blowing the nose is prevented, with subsequent infection and putrefaction of the stagnant secretion. In uncomplicated cases these polypi are continually bathed in the serous secretion which is drawn out of the inflamed mucous membrane, partially through osmosis and partially through gravity, and adds to the irritation of the parts already occasioned by the presence of the polypi, thereby furthering the likelihood of infection. On recalling the accepted theories of the mechanism by which the sinuses become infected, a secondary infection of one or more of these cavities under these conditions is but to be expected.

Empyema of the maxillary sinus, coupled with chronic hypertrophic ethmoiditis, frequently occurs, in which it is impossible

to state the primary or the secondary infection. We take it, however, that the ethmoidal affection was always the primary.

Typical primary empyema of the cells presents a totally different picture from the above. The pale, glazed polypi or polypoid hypertrophies are here absent, their place being taken by fibrous swelling or oftener atrophy of the mucous membrane, purulent discharge, foetor, etc.

A characteristic picture of empyema is the presence of crusts in the nasal passages, a symptom which always fails in chronic hyperplastic rhinitis. These symptoms, together with redness and thickening of the processus uncinatus, will be sufficient to differentiate the two affections.

SYMPTOMS.

The patient has the experience of a continuous cold which is not influenced by the ordinary treatment. He also complains of frequent attacks of sneezing, a continual sense of tickling in the region of the superior nares, headache, sharp pains above and below the orbital cavity, ciliary neuralgia and a more or less profuse secretion from the diseased side.

One of the principal symptoms is the headache which manifests itself as a drawing, sticking pain between the eyes, above and below the orbit, sometimes radiating toward the temples. In acute exacerbations of chronic ethmoid disease the headache is severer, of a more diffuse character and radiates toward the occiput and mastoid process, which is also typical for affections of the sphenoid sinus. Occasionally there is marked dizziness, the patient experiencing the feeling as though the eyes were being bulged outward.

On the other hand the affection may run such a latent course that the patient consults us on account of other troubles, such as disturbances of the olfactory function, pharyngeal affections, tinnitus or deafness. All these not infrequently take their origin from this disease.

The olfactory sense is usually affected partially through hypertrophy of the middle turbinate (*anosmia respiratoria*) and partially through anatomical changes (*anosmia essentailis*). Subjective *kakosmia* is not infrequently connected with this condition. An unpleasant taste in the mouth is often present in the morning, due to the fermentation of the secretion which has collected in the choanæ during the night. This secretion during the day, on account of its profuseness, is most annoying, as the patients can scarcely keep their handkerchiefs out of sight, using from five to

twenty daily. This abundant flow of secretion leads externally to maceration of the epithelium around the orifices of the nares, with subsequent eczema and internally to pharyngo-laryngo-bronchitis and asthma.

Among the sequelae may be enumerated pharyngitis lateralis, hyperplasia of the pharyngeal and faucial tonsils, Eustachian and middle ear catarrh.

The orbital manifestations of chronic hyperplastic ethmoiditis are of especial interest, not only on account of the obscure picture which they often present, but also on account of the frequency with which they appear. These are usually of mechanical origin, due either to the intra-cellular pressure from the hypertrophied mucous mebrane or from stasis in the hæmatogenous or lymph channels, or both. These may be enumerated as follows:

1. Interference with the mobility of the globe.
2. Irritation of the optic nerve through pressure.
3. Changes in the refraction.
4. Disturbance of physiological lachrymation (epiphora).

The subjective symptoms consist of scotoma, neuralgic pains in the eye, ciliary neuralgia and photophobia. In severe cases of vaso-motor disturbances, such as hyperemia of conjunctiva and edema of eyelids and peri-orbital tissues may occur. The appearance of these reflex neuroses is but to be expected when one recalls that the orbital and nasal cavities are supplied by the same sensory nerve.

CONCLUSIONS.

1. The ethmoid bone is subject to the following inflammations: (a) Acute inflammation; (b) chronic hyperplastic inflammation cum polyposis; (c) chronic suppurative inflammation.

2. Hyperplastic ethmoiditis results from continued irritation of the mucous membrane without infection. When infection occurs an empyema results.

3. One can always judge whether the ethmoid is diseased after infracture of the middle turbinate. The irritation being coincident with the inspired air always primarily attacks the basal cells, therefore the floor of the ethmoid capsule is the first structure to show pathological changes.

4. Hyperplastic ethmoiditis presents a much stronger line of symptoms than suppurative.

5. Rhinorrhea is due to hyperplastic ethmoiditis. The middle turbinate is swollen against the ostii, the mucous membrane

engorges upon itself and the secretion becomes squeezed and sucked out.

6. Typical suppurative ethmoiditis runs its course without polyp formation and simple hyperplastic inflammation without pus.

7. The presence of pus in hyperplastic ethmoiditis is due to irritation and infection; fetid pus is due to saprophitic infection.

SOME OCULAR SYMPTOMS OF DISEASES OF THE ACCESSORY SINUSES.

WILLIAM CAMPBELL POSEY, M.D.

PHILADELPHIA, PA.

At the Seventy-second Annual Meeting of the British Medical Association, held in Oxford, July, 1904, Onodi of Buda-Pesth, in a paper entitled "The Disturbance of Vision and Development of Blindness of Nasal Origin Induced by Disease of the Posterior Accessory Sinuses," detailed the answers which were received to a series of questions which had been submitted to a number of leading German ophthalmologists regarding their experience in the occurrence of optic neuritis as a consequence of disease of the sinuses. In view of the light of our present knowledge of the subject, and I may say of the experience at even that time, of quite a number of American eye surgeons, the answers were most surprising, inasmuch as nearly all the collaborators to whom he addressed his questions averred either that they had failed in any case to establish a connection between sinusitis and optic neuritis, or mentioned merely one or more isolated instances from their vast experience, in which the affection of the optic nerve seemed actually to be dependent upon sinus involvement. These answers were obtained from such masters in ophthalmology as Leber, Schmidt-Rimpler, Sattler, Axenfeld, Hirschberg and Wilbrand and Saenger. But all this is changed now, and today there is probably not one of these observers who would not be willing to subscribe to the impression which is general among ophthalmologists of all lands, and agree with them that disease of the sinuses is a not infrequent cause of optic neuritis, as well as of other morbid conditions of the eyeball and its adnexa. Onodi abroad, and Holmes, Dixon and Loeb at home have worked diligently at the study of the anatomical relationships of the sinuses, and from all over the world there has come a mass of clinical evidence which has convinced the most skeptical of the necessity of considering the sinuses in all cases of obscure ocular inflammations.

When the Committee on Program requested me to prepare a paper upon the title set opposite my name, I consented with considerable diffidence, not only because I had already previously presented a number of papers under some such title, but also because a review of the literature as well as my own experience

has taught me, that the ocular symptomatology of sinusitis practically embraces the entire realm of ophthalmology, and that there are but few pathological states of the eye or its adnexa which may not be induced by diseased conditions within the cells. It is true that despite the labors of the anatomists and pathologists, of whom I think we are willing to grant our Hungarian colleague first place, the precise manner in which the ocular inflammation is evoked by the sinusitis is still for the most part undiscovered, though the comparatively recent monographs by Onodi on "The Optic Nerve and the Sinuses," and Loeb's paper before the New York Academy of Medicine last autumn are evidence that the manner of involvement of the optic nerve and the nature of the inflammation in that structure at least is no longer a mere matter of conjecture.

The frequent escape of the optic nerve from inflammation, in even the most marked cases of sphenoidal and ethmoidal disease, is explained by the anatomical variations which these observers have recorded, and the answer given, in part at least, to the query why a searching examination of the eye fails to reveal any sign of abnormality, even in very many cases of intense sinusitis.

At this juncture I shall venture to particularize upon a few of the less striking symptoms which sinusitis may invoke, although I shall find it necessary to repeat in part what I said in January last before the Eastern section of the American Laryngological, Rhinological and Otological Society and at other meetings.

And first I would call attention to the dull ocular pain, to the photophobia and the conjunctival symptoms after any use of the eyes, which glasses at times fail to relieve, but which disappears entirely after rhinological treatment. In this class of cases, after finding difficulty in determining the proper axis of the cylinder in correcting the astigmatism, and other vagaries in the behavior of the ciliary muscle, I have referred the cases to rhinologists and have been gratified to learn that their treatment has relieved the condition. My friend, Dr. Packard, who has observed quite a large number of such cases with me, has summarized his findings as follows: "In this class of cases there will be found a septal spur or deflection upon which the swollen turbinate impinges, or congestion of the sinuses, with possibly an accumulation of nonpurulent secretion within them, due to the occlusion of their orifices by swelling of the turbinate tissues." As I have already stated several times, it is this class of cases that the ophthalmologist often masks the real source of the asthenopia

by drying up the nasal and sinus mucous membrane by the atropine which he employs to put the ciliary muscle at rest, the disappearance of the symptoms being due quite as much to the subsidence of the nasal as the ocular congestion.

As a result of our conjoined work, Dr. Packard and I have found that there is a very large class of cases which present not only asthenopia but other ophthalmologic symptoms as well which are undoubtedly attributable to old sinus trouble, but in which at the time they are seen by the rhinologist no pus is to be found in any of the sinuses, although the history points to sinus origin of the patient's catarrhal trouble. These are cases which give a history of grippe with intense head pains, followed by a profuse purulent discharge from the nose, leaving later more or less so-called catarrhal trouble in reality originating from the sinuses.

This seems to be a most important observation, and is in line with a statement of Axenfeld, that in cases of orbital cellulitis, in which the nasal examination is negative, the original sinusitis which occasioned the orbital condition may have healed by evacuation into the nose, while the orbital condition is progressive, on account of the absence of drainage. Indeed, Axenfeld was able to actually demonstrate by exploratory trephining that the original sinusitis may be healed at the time the orbital condition is under treatment.

Edema of the lids is one of the most significant symptoms of disease of the sinuses, and may often be the means of calling attention to the existence of an inflammation in their cells, the extreme thinness of the skin of the lids, and its loose attachment to the sublying parts, causing even a comparatively slight sinusitis to give rise to this condition. Like other ocular symptoms of sinusitis, the edema may be but transient and may disappear for a time with the discharge of the secretion from the sinus, but reappear when the fluid reaccumulates and the congestion of the mucous membrane becomes greater. The puffiness is usually most marked in the upper lid and particularly to the nasal side, though the entire lid may be swollen. This edema is to be distinguished from the inflammatory swelling and thickness of the lid which results from cellulitis, as it is entirely non-inflammatory in origin as well as in appearance, and also from the ptosis which is at times present as a result of a palsy of the levator of the lid. The swelling is usually most marked in the mornings and disappears during the day, but it is also apt to be brought on by bending the head forward. I well remember a man in adult life who con-

sulted me at the Polyclinic Hospital some years ago on account of a swelling of the upper eyelid of the right eye which had persisted more or less constantly for several months. There was no evidence of ocular disease, but a rhinological examination being instituted, Dr. Freeman found a small quantity of pus in the right antrum. As soon as the pus was evacuated the edema disappeared, though it reappeared on several occasions later, after some of the purulent secretion had been permitted to reaccumulate.

Upon account of the subsidence in the inflammation in and around the sinus, which follows the exit of pus from its cavity, and the increase in inflammatory reaction which is occasioned by the retention of secretion, the symptoms of sinusitis are frequently not constant but intermittent. It is by reason of this peculiarity that cases in which the sinusitis has occasioned a paralysis of one or more branches of the oculo-motor nerve, may simulate very closely the rare condition known as migraine ophthalmoplegique. In this affection, as is well known, there is a paralysis of one or more branches of the third nerve, associated with violent migraine, nausea, vomiting and fever. The attacks last varying periods, and recur at long or short intervals.

While the weight of evidence attributes a central origin to this peculiar condition, there are some authors who claim that the symptoms may be accounted for by peripheral lesion; thus, Schmidt-Rimpler, for example, believes that they originate in a rheumatic periostitis of the apex of the orbit. There are other cases in which an involvement of one of the sinuses appear to have been the starting point of the ocular palsy. Among these may, perhaps, be included the case of Coombs-Knapp, in which all the branches of the left third nerve were affected. The paralysis was ushered in by pain, nausea and vomiting, and was attended with anesthesia in the upper two divisions of the fifth nerve. The first attack lasted seven weeks, with practically complete recovery; the second attack was more severe and persisted nearly five months, and at the end of that time recovery was not complete. Although the author thought that recurrent third nerve palsy was best explained on the hypothesis of some vascular change, inflammatory or edematous, or by a focal lesion involving the root of the third nerve, the history of his case indicates, as has just been mentioned, a probable disease of one of the sinuses, as he states in his notes that "the patient complained much of soreness inside the left nostril, as if there were sores there, and of a discharge of thick lumps of bloody mucus,

which were very hard to get out. After clearing the nostrils in the morning, the pain and tenderness diminished. There was marked photophobia and the pain was neuralgic in character and most marked on the left side of the head." Dr. Spiller and I have had several such cases of pseudo-migraine ophthalmoplegique under our care, and in one striking instance, where for a time a cerebral tumor even was suspected, all of the palsies disappeared after a rhinologist had drained the ethmoidal and sphenoidal cells.

Another class of cases which may be excited by a sinusitis, and which are of great interest to the ophthalmologist, are those designated as "prelacrymal abscesses," referring by this term to the swelling which forms at times above the internal palpebral ligament, and somewhat external to the lachrymal sac. While its position serves to differentiate it readily from abscesses of the sac itself, it is frequently mistaken for that condition, and Bowman's operation is performed. In many of these cases, as is well known, the abscess results from a necrosis of the lacrymo-ethmoidal cells, in others it marks the point of suppuration of the frontal cells, which frequently have an anomalous distribution. Abscesses of deeper parts of the orbit may point in this region, the purulent matter gravitating into the neighborhood of the sac by the peculiarity of the insertion of the facia.

Though the differential diagnosis in these cases of prelacrymal abscesses is usually comparatively simple, at times the pus gravitates behind the sac in such a way that the exit to it is closed, and an ectasia of the sac itself occurs with all the signs of true lacrymal abscess. Incision by means of the Bowman procedure does not, however, liberate any pus, the purulent matter escaping only after the probe is withdrawn and passed horizontally into the cells forming the inner orbital wall.

I have encountered a number of such cases and have been compelled to resort to extensive incision and drainage in place of the simple dilatation which I had planned. Some years ago I operated upon an old lady who presented the appearance typical of simple mucocele of the sac. The quite pronounced swelling which was present was in the classic position and when the finger was applied the contents apparently steadily emptied themselves into the nose, for there was no regurgitation into the conjunctival cul-de-sac. Her physician, who was somewhat of a throat and nose specialist, had pronounced her nose free from disease, though the turbinates were noted as being swollen. The sac was incised by the ordinary Bowman procedure, but without avail,

no pus escaping until a deeper incision was made into the tissues back of the sac, when a large quantity of pus escaped from the lacrymo-ethmoidal cells, which were found, upon probing, to be extensively diseased.

Peters described similar cases in 1902, in *Die Zeitschrift für Augenheilkunde*, which he had found to originate in empyemas of the frontal and ethmoidal cells and in rare instances in a maxillary periostitis excited by carious teeth.

Despite the close and intimate association which the blood vessels and lymphatics of the nose and sinuses have with the ocular, vascular and lymphatic systems, I have never been able to assure myself, except perhaps in one instance, that an inflammation of the uveal tract had actually arisen from a sinusitis. It is true that in a number of instances I have seen cases presenting this type of ocular inflammation improve under nasal treatment, but the mere fact of such amelioration is no proof of the actual dependence of the ocular inflammation upon that within the cells, and it seems to me at least that a more intimate knowledge of the pathological relationship of the parts is necessary before it will be proper to subscribe to the claims of Ziem, Fromaget, Fish and others.

INDICATIONS FOR OPERATION UPON THE SINUSES.

WILLIAM LINCOLN BALLENGER, M.D.

CHICAGO.

In a study of the operative indications the sinuses naturally fall into three groups, namely: (1) The maxillary sinus, (2) the posterior ethmoidal and sphenoidal, and (3) the frontal and anterior ethmoidal. This subdivision is due to the anatomical arrangement of the drainage system of the sinuses, and the relation of some of the teeth to the floor of the antrum.

The drainage and ventilation of the antrum is effected through the osteum maxillare, which opens into the bottom of the infundibulum, a gutterlike depression in the outer wall of the nose, beneath the middle turbinated body. In about half of the cases the sinus has additional drainage and ventilation through one or more accessory openings above and posterior to the infundibulum in the membranous portion of the naso-maxillary wall. It would be of interest to know whether the accessory openings influence the frequency or character of the infection of this sinus. Theoretically the accessory ostei should reduce the frequency and severity of the infection and inflammation on account of the better drainage and ventilation they afford. If, for example, the osteum maxillare is obstructed, the accessory ostei would still afford ample drainage and ventilation and this reduce or prevent infection and inflammation. If, however, there are no accessory ostei and the osteum maxillare is obstructed, the conditions are most favorable for infection and inflammation. We propose, therefore, to base our study upon the broad principle of adequate drainage and ventilation and certain other conditions which we believe are of secondary importance.

I. *The Maxillary Sinus.*—When the maxillary sinus is the site of infection and purulent inflammation, how shall we determine what type of operation is required to establish free drainage and ventillage?

Several factors enter into the equation. Of these the first is, was the infection of intra-nasal or dental origin? If of dental origin, the proper treatment of the carious tooth, combined with simple puncture through the naso-maxillary wall, may be all that is required to effect a cure.

The acuteness and chronicity of the disease also influence the choice of operation. If the attack is acute and primary, astrigent

remedies, cocain, adrenalin and antipyrin, locally applied, or simple puncture and lavage may be effective. If the attack is an acute exacerbation upon an old chronic inflammation these remedial measures would in a large number of cases only relieve and not cure the disease. In other cases they would be effective.

If the exacerbation is severe and one of several such manifestations, the naso-maxillary wall should be extensively resected, including the anterior half of the inferior turbinal. The partial removal of this wall is usually attended by a continuation of the disease, as the opening rapidly closes by granulations from its margins.

If the conditions prescribed in the preceding paragraphs are present and polypi are found in the maxillary cavity, the complete removal of the naso-maxillary wall may not establish a cure, as the polypi and diseased mucous membrane are not accessible through the nose and simple drainage and ventilation are not always followed by the regeneration of the diseased mucous membrane. In these cases the Caldwell-Luc and the Denker operations are indicated. The Denker operation is the more effective as by it the whole of the sinus is exposed to curettement.

II. *Posterior Ethmoidal and Sphenoidal*.—When confronted with posterior ethmoidal and sphenoidal disease there is no choice as between an intra-nasal and extra-nasal operation, as these cavities can only be reached through the nasal chambers, unless, indeed, they are approached via the inner angle of the orbit, a route much less desirable than the intra-nasal one. The only question is as to the extent of the intra-nasal operation. That is, will the partial or complete removal of the middle turbinal establish free drainage and ventilation, or will it be necessary to exenterate the cells?

If the case is catarrhal, or only discharges pus during an attack of acute coryza, the removal of the middle turbinal may be all that is necessary. Such cases are usually characterized by headache more pronounced (in its beginning) on one side, often present upon awakening of mornings, and dizziness upon stooping. Objectively the nasal cavities may be free of purulent secretion, except when the patient is suffering from acute coryza, at which time purulent secretion is present. The middle turbinal is usually bullous and lies against the septum. Such cases are often cured by the removal of the middle turbinal. If in addition to the above symptoms there is a chronic purulent secretion discharging through the olfactory fissure, and through the choanae into the epipharynx, and if polypi are found in the olfactory fis-

sure, the middle turbinal and posterior ethmoidal cells should be completely exenterated. The anterior wall of the sphenoid should also be freely removed. The complete exenteration of the posterior ethmoidal cells is not always easy to do, nor even possible in some cases, as the anatomical arrangement of the cells in relation to the sphenoid and the other structures of the head renders them inaccessible except by jeopardizing vital structures. Dr. Wales has a bony specimen in which the cells pass around the side of the sphenoid sinus to its posterior aspect, and seem to communicate with the mastoid cells. In such a case it is obviously impossible to completely exenterate the ethmoid cells. I have a case under my care in which the posterior ethmoidal cells extend backward along the side of the sphenoid sinus on the right side, and in so far as I am able to demonstrate they may even pass behind it. I have been unable in this case to completely check the ethmoidal discharge.

If the sphenoidal involvement is acute or subacute, the removal of the middle turbinated body will usually establish adequate drainage and ventilation. If it is chronic and the mucous membrane is edematous or has undergone polypoid degeneration, it will be necessary to first remove the middle turbinated body and then completely remove the anterior wall of the sphenoid cavity, especially at its lower portion, where the wall may be from one-eighth to one-fourth inch in thickness. A Hajek or a Fletcher punch forceps should be used for this purpose as they are powerful enough to cut the heavy bone.

The Frontal and Anterior Ethmoidal Cells.—As the frontal and anterior ethmoidal cells are nearly always simultaneously involved, it is necessary to consider the surgical indications together. Indeed, this fact throws a suggestive sidelight upon the choice of an operation. It is obvious that if both systems of cells are simultaneously involved an operation must be chosen that will adequately drain both. If the disease is primary and acute the application of ischemic remedies, as cocain and adrenalin, to the upper and anterior portion of the nasal chamber may establish good drainage and ventilation. If this fails the removal of the anterior half of the middle turbinal may clear the region of the infundibulum of the obstruction and establish free drainage and ventilation. If, after removing the middle turbinal, polypi are found at the margin of the hiatus semilunaris, they should be removed.

If the polypi arise from the interior of the anterior ethmoidal cells it will be necessary to partially exenterate them via the nasal route. If the bulla ethmoidalis is enlarged and overhangs the

hiatus, it should be removed to establish drainage and ventilation of the infundibulum. Indeed, any obstruction in the "vicious circle" of the nose should be removed. That is to say, a high deviation of the septum crowding the middle turbinal against the hiatus semilunaris, a bullous or hyperplastic middle turbinal, an enlarged or overhanging bulla ethmoidalis, or cells in the uncinate process which obstruct the infundibulum, should be removed or corrected.

If the case is mild and chronic the procedures above enumerated may effect a cure, though in many instances they will fail. If they fail the case may still be treated by the intra-nasal route, by enlarging the fronto-nasal duct or removing the floor of the frontal sinus. The choice of operation under these conditions lies between the Ingals, the Halle and the Good operations. The Ingals operation enlarges the fronto-nasal duct with a pilot burr, the Good operation with a rasp, while the Halle operation removes the floor of the frontal sinus with a series of specially devised burrs. Of these the Ingals is the simplest and is perhaps attended by the least danger, though it does not establish as large an opening as the Good and the Halle operations. It also necessitates the use of a drainage tube for several weeks or months.

If the case is chronic and is attended by acute exacerbations with frontal tenderness, an external operation should usually be performed. Of the external operations I can only recommend the Killian, as it includes the exenteration of the anterior ethmoidal cells. Of the twenty-five Killian operations performed by me the external deformity has been an almost negligible quantity except in one case in which the frontal sinuses were large and deep.

Special Indications.—There are certain special indications for operations upon the sinuses which have not been given in the preceding portion of this paper. They are (a) ocular symptoms, (b) skiagraphic findings, (c) intra-cranial complications and (d) hay fever.

(a) **Ocular Symptoms.**—It is now generally admitted that certain eye symptoms are caused by sinus infection, whether catarrhal or suppurative in type. It is beyond the province of this paper to enter into a general discussion of eye symptoms in relation to sinus disease, hence I will limit my remarks to a few ocular indications for surgery of the sinuses.

(a) **Asthenopia** or imbalance of muscles of accommodation is frequently due to irritation within the ethmoidal cells. I have repeatedly proven this by the proper attention to the ethmoidal

labyrinth, a procedure which has been followed by the complete relief of the asthenopia. Whereas, before the treatment of the ethmoidal disease the patient could not be properly fitted with reading glasses, after it he could be perfectly fitted. In these cases it is often only necessary to fracture the anterior portion of the middle turbinal and force it toward the septum, or remove a portion or all of the middle turbinated body which forms a part of the ethmoidal sinus labyrinth. In others it may be necessary to exenterate some of the cells.

Partial or complete blindness may be due to infection of the sinuses, the blindness in all probability being due to the absorption of toxic material from the affected sinuses. I have seen and operated upon three cases of toxic amblyopia of a sinus origin. In one case of complete blindness of recent origin I did a double exenteration of the ethmoidal and sphenoidal sinuses, which was followed by the return of vision to normal. In the second case the result was not as good, as the blindness had been present for four months before the exenteration. In the third case no improvement followed the operation, the partial blindness having been present for nearly two years before operation. These cases have been reported in a previous paper and are referred to here for the purpose of emphasizing sudden or rapidly developing blindness as a possible indication for the surgical treatment of the sinuses. Pressure paralysis of the optic and motor nerves of the eye may also constitute indications for operation upon the sinuses. Much more might be said upon this subject but space does not permit.

(b) Skiagraphic Indications.—Skiagraphs of the sinuses show the presence of disease, but not the exact pathological condition present. For example, given four cases, the first with catarrhal inflammation, the second with simple suppurative inflammation, the third with polypi and suppuration, and the fourth with the frontal sinus denuded of its mucous membrane, the skiagraphic plates will each be cloudy over the frontal sinus, but will not indicate the pathological differences. The plates will, however, show anatomical points which will aid in choosing an operative procedure.

First, the size and depth of the frontal sinus is shown. If deep and large the operator should hesitate to do a Killian operation on account of the great deformity which would probably result. If the sinus is not deep and large, and all the other symptoms indicate an external operation, the Killian operation should be elected.

Second, the plate will show the presence or absence of septa in the frontal sinuses. If absent and the case is simple an intra-nasal operation may be performed with a reasonable assurance of success. If septa are present an intra-nasal operation will probably fail.

Third, the skiagraphic plate will show whether or not the ethmoid cells extend over the orbital roof. If they do an intra-nasal operation upon the ethmoidal labyrinth will probably fail to effect a cure. Such a case will probably require a Killian operation.

(c) Intra-cranial Complications.—The significance of brain abscess and meningitis complicating infection of the nasal accessory sinuses is sometimes an important one. When brain abscess complicates the sinus disease the affected sinus or sinuses should be radically operated. When meningitis complicates the disease the sinuses should not be operated. To operate under such conditions would in all probability excite an acute exacerbation of the meningitis and hasten a final issue.

(d) Hay Fever.—Whether hay fever is ever due to sinus disease is, I presume, still an open question. The late Dr. Schadle called attention to the apparent relationship of antrum disease to hay fever, and cited some cases which were greatly benefited by lavage of the affected antra. Pyncheon has since then also made similar observations. Personally I have not observed such relationship. I have, however, seen hay fever subjects who were afflicted with ethmoidal and frontal suppuration relieved of all, or practically all, of the hay fever symptoms by the surgical treatment of the ethmoidal and frontal suppuration. In one case I did a complete exenteration of both ethmoidal labyrinths, and afterwards did a double Killian operation upon the frontal sinuses. The patient after three years is completely relieved of the hay fever symptoms. Previous to the operation she was compelled to sleep in a sitting posture for three months each summer and autumn. This, and other cases of a similar nature, have led me to infer that sinus disease, especially anterior ethmoidal and frontal, may be a more frequent cause of hay fever than heretofore suspected.

I suspect that catarrhal frontal and ethmoidal sinusitis is a more frequent cause of hay fever than the suppurative type. The constant discharge of acrid mucus over the area of distribution of the anterior ethmoidal nerve might well render this area hypersensitive to the pollen or other irritating substances which are the active causes of hay fever. I do not claim, nor do I believe, that sinus disease is a constant factor in the etiology of hay fever.

I only suggest that it is sometimes a cause. If this is true, hay fever may be an indication for the surgical treatment of the sinuses, more especially the frontal and anterior ethmoidal.

DISCUSSION.

DR. A. REEVE, *Toronto*:—I regret, Mr. Chairman, that I had no notice of being called upon in this way before leaving home, else I might have brought some photographs with data to illustrate points in the subject under discussion. I presume that the title of the last speaker's paper possibly precluded him from alluding to cases where operative interference is contra-indicated, and I, therefore, take the liberty of citing two cases by way of illustrating this phase of the subject.

About twenty-five years ago I was consulted by an old gentleman who was suffering intensely. He had a marked exophthalmos, with a decided protuberance at the inner canthus, and on examination I found that the nose was completely blocked on that side, by a growth which had already crept around behind the vomer and was invading the posterior nares of the opposite side. I declined to meet the old gentleman's wishes and operate, because I considered an operation could not be radical and it would hasten the fatal result. Evidence has accumulated since that time to show that where the orbit is involved secondarily to the sinuses by malignant growths it is practically impossible to do a really radical operation. But I did in his case what I have done on various occasions, that is, to give relief from the pain of tension, made an incision in the tarso-orbital fascia, which was greatly stretched.

Again, about eight years ago I was requested by the family physician to see a gentleman, perhaps 75 years of age, whom he had been treating apparently for hypertrophic rhinitis. I was called in on the ophthalmic side, because latterly the patient had complained of diplopia. There was a slight displacement outwards of the right eye, with paresis of the right internal rectus, and slight edema at the inner canthus. On rhinoscopic examination a diagnosis of sarcoma was made, which was later confirmed by microscopic examination. In this case also I advised against an operation, because there was no pain and the paresis of the internal rectus was apparently not due to implication of the nerve supplying the muscle, but to direct involvement of the muscle itself, the growth having softened the orbital plate of the ethmoid and encroached upon the orbit. A general surgeon of high repute, of New York, saw the case, but the patient was not operated upon, and in a few weeks he passed away.

A third case illustrates very markedly some of the ocular and orbital symptoms secondary to accessory sinus disease, in which an operation on the orbit was indicated: A young woman who had had a rhinorrhea on the right side for some time, quite evidently traceable to disease of the ethmoid, without polypoid excrescences, had acute orbital symptoms following a coryza as the result of exposure. She presented marked exophthalmos, enormous distension of the upper lid, closure of the eye, fixation of eyeball and great chemosis, so that the conjunctiva protruded between the lids. She was suffering intensely, and an incision was at once made with a long, narrow knife through the upper lid along the inner wall of the orbit, passing far back. A probe revealed bare bone at the ethmoid plate and it was easily passed into the ethmoid cells. In this case the pus escaped readily, and the use of a syringe caused a decided flow into the nasal cavity, indicating very good drainage. With this line of treatment, simple drainage and irrigation with perchloride

solution, the case went on to perfect recovery, with normal vision and motility and disappearance of all symptoms.

I might say perhaps twenty years ago I published a series of cases of frontal sinus disease, largely empyemas, in which what would now be called the older treatment was carried out,—simply making an incision below the inner end of the eyebrow, and then with a drill or chisel making a moderate-sized opening through the bony wall, irrigating the sinus, and then passing a perforated rubber tube down the reopened infundibulum and out at the anterior naris. This line of treatment—drainage and irrigation—has been followed successfully in a large number of cases which fortunately were not complicated, it would seem, with involvement of the antrum, etc. Involvement of the frontal and ethmoidal sinuses and of the orbit secondarily seems to provide a common meeting ground for the ophthalmic surgeon proper and the rhinologist. I believe a certain percentage of these cases such as those cited above should be left to the ophthalmic surgeon, but it is our bounden duty always to examine the naso-pharynx, and if satisfied that the condition of the antrum and ethmoids, etc., requires special attention, the case might well be treated conjointly with the rhinologist.

Other cases where the orbit is not involved seriously and where intra-nasal treatment is likely to effect needed relief, would seem appropriate for the rhinologist.

DR. W. L. BALLENGER, Chicago:—I was much interested in Dr. Reeve's remarks, showing the contra-indications to operation, which he said my paper did not cover. The cases to which he refers were all of tumors of the orbit. Dr. Reeve also referred to the cure of frontal sinusitis by a simpler operation than the Killian, but these, I imagine, were all acute cases which I believe now would be better treated by intra-nasal operation, either removal of the middle turbinate and curetting the cells, or making an enlargement of the fronto-nasal duct, and not by an external operation at all.

Just a word more in regard to Dr. Skillern's paper. I cannot conceive of an inflammation, as Dr. Beck has said, the exact cause of which is not due to an infection; whether it be an inflammation causing hyperplasia or pus, the infection is there. If you have a catarrhal inflammation of any of the sinuses, it is still an infection. Inflammation of the sinuses, whether catarrhal, serous or purulent of type, is still an infection, and, therefore, it seems to me, we have to think of these cases as infections primarily, and that should influence the treatment to be followed.

Now as to the skiagraph. Dr. Beck has had much experience, and I do not wish to controvert his position. Personally I am not able to distinguish between plates from catarrhal, polypoid and suppurative cases by means of the skiagraph. I have done double Killian operations, which relieved hay fever, in which on one side the bone was denuded and chalky, and on the opposite side the membrane was intact, in which the skiagraph did not differentiate the two sides.

I have already referred to Dr. Beaudoux's acute case. I think a better operation would be an intra-nasal one.

DR. GEO. B. JOBSON, JR., Franklin, Pa.:—The papers read and the discussion which has followed shows the inter-relation between rhinology and ophthalmology. Rhinitic conditions with symptoms which are striking are easy of diagnosis, but the obscure cases referred to, those in which the deep sinuses are implicated and are mildly inflamed, are the ones which give us trouble. If I may be pardoned for doing so, I should like to cite a case, having had two which were quite similar, but a description of one will suffice.

A woman, thirty-five years of age, was refracted two years ago, and her glasses were apparently satisfactory. She returned quite recently, saying that her left eye pained her, that the pain radiated deep into the tissues, and that her vision was slightly impaired. She was carefully gone over, no external abnormality noticed about the eye, the ophthalmoscope detected nothing abnormal, except perhaps a slight congestion of the vessels. She was carefully refracted and it was considered that a change in lenses wouldn't help her. She was told to return home and rest the eyes for a week, which she did. On coming to the office a second time, she complained of severe pain again, saying that it had increased in severity, and in addition to this she spoke of a "glimmering" sensation. This led me to make a more careful examination of the eye for color, and central scotoma for red was discovered. Rhinological examination disclosed the fact that there was a greatly hypertrophied middle turbinate, which was very sensitive and completely occluded the upper part of the nasal passage. A considerable portion of the turbinate was removed and there was a rush of muco-purulent material. This gave relief from pain and in the course of a week the scotoma for red disappeared, and the eye cleared up entirely. So, I think it behooves us in the obscure cases to examine them carefully, especially for the color sense, for evidently in this case the maculo-papillary bundle was implicated, by extension of a chronic inflammation from the posterior ethmoid cells, or sphenoid sinus. The maculo-papillary bundle, although centrally located in the optic nerve, is the most delicate portion of it, and the most susceptible to inflammation. When a patient complains of a "glimmering" and there is a central scotoma for color, we should think of deep inflammatory trouble, such as sinusitis of the ethmoid or sphenoid.

DR. SANTOS FERNANDEZ:—The ocular symptoms in sinus disease may be deceiving if we try to fix the origin of the disease and the course it takes. We had opportunity to observe a case of a female child with optic neuritis and exophthalmos, due to the fact that her left nasal fossa was filled with a large amount of polypi which had recurred after several operations for removal. We presumed that the exophthalmos was produced by the perforation of the internal wall of the orbit, but after making an exploratory incision we felt with the index finger that the floor of the orbit was perforated because the polypi had passed from the nasal fossa to the antrum of Highmore and distended and perforated its superior part. The different surgical interferences that were made did not succeed in extinguishing the polypi and the child died from an intercurrent intestinal disease.

DR. G. STERLING RYERSON, Toronto, Canada:—The case Dr. Fernandez reminds me of a case I had under care, a man complaining of failing vision. Examination showed papillitis, and there was no history of syphilis or other such cause. I examined the nasal cavity of the corresponding side and found numerous polypi and caries. Clearing out the nasal cavity and the carious condition caused a cessation of the symptoms. There was, however, still considerable defective vision, due to the fact that the condition had been going on for some time and there had been interference with nutrition of the optic nerve.

DR. WENDELL REBER, Philadelphia:—If there is one thing that stands out in the anatomical discussion of these papers this afternoon it is that we should learn that the typical sinus is quite likely to be the atypical sinus. We find as many atypical cavities as we do typical ones. I think that any conclusions based upon the presumption that we find typical sinuses should be abandoned. The inflammatory cases are always interesting; they are becoming an old story; but it is one of the best accepted

clinical facts today that obscure inflammatory symptoms about the eye, especially when unilateral and without any constitutional basis, should almost invariably suggest a focal origin. This has been the belief among advanced ophthalmologists for the past ten years; in such cases the most likely focus of origin is some one of the accessory sinuses. Search now should be directed to the obscure and minor forms which, to my way of thinking, are more frequent than the purulent cases. They reveal themselves readily, and I think the majority of the cases today will be properly dealt with. Cases like those cited by Dr. Jobson are more numerous than generally supposed. A slight degree of exophthalmos, I am inclined to think, is a common thing, but unless it is sufficient to be disfiguring it is very easily overlooked even by the ophthalmologist. Lid edema is one of the most suspicious of all symptoms—a transitory edema. A case in point came to me last spring. I refracted her and she did very well for a while, but returned on account of asthenopia on the left side and on account of a recurrent conjunctivitis. I could find no cause for her asthenopia, and I referred her to her general physician. She came back three weeks ago, when I found her left eye slightly proptosed, by means of the exophthalmometer devised by Hertel of Jena. By the clever arrangement of two mirrors the prominence of the cornea can be measured in millimeters. This woman showed a prominence of 5 mm. on that side, a little ocular tenderness and no edema. I referred her to a rhinologist, and he promptly recognized a congestive ethmoiditis, treatment of which has relieved all of her troublesome symptoms. I have mentioned cases in other medical societies of failure of accommodation on one side entirely relieved by nasal treatment on the same side, and I am inclined to think that the ophthalmologist should either acquaint himself with general rhinological technique enough to be able to make these examinations himself, or if not able to do so, to refer the cases to some competent rhinologist.

DR. JOSEPH BECK, Chicago:—I would like to make a few remarks in connection with Dr. Skillern's paper, which interested me very much, because I have read with interest the work of Uffenorde and his original article, and because I have for several years past satisfied myself personally, in my own few cases, that there are true pathological conditions about the ethmoid, such as he spoke of, as the hyperplastic type that had ocular symptoms, which were, I might say, promptly relieved by operative interference, even though it was not very extensive; not the infraction, but the removal of the anterior half of the middle turbinate body. I want to mention a Chicago man, Dr. Brawley, who related two or three years ago some characteristic cases which are suggestive of this condition. Exception is taken to Uffenorde's contention that this is not an infectious process. I believe it is an infectious process, although not necessarily pus present. We know we may have a low grade of infection without a purulent condition, and these cases are unquestionably infectious, because we know that when an acute process is set up like a rhinitis; there is a pus condition rapidly following.

In regard to the anatomical specimens, I would like to call attention to the sphenoid sinus specimen I have here, in which the carotid artery is bare in the cavity, and one could easily injure that structure in operation. Now Dr. Ballenger, and also Dr. Dixon, allude to the radiograms, and I would like to say that they are of considerable value in diagnoses to me. Dr. Ballenger doubts the possibility of diagnosing the pathological condition present. It is not to be put aside as easily as that. I can tell a necrosis or a sinus that is full of polypi from one where there is a simple swelling. It is a matter of judgment of the degree

of shadow and practice in interpretation. No rhinologist will depend upon a simple radiogram, without intranasal examination, however. The recent development of stereoscopic radiograms is of value for anatomical and pathological diagnosis, and I am sure that as this method develops it will be a great aid in diagnosis. Personally I am a great believer in the association of nasal and ocular disease, because I have obtained relief of these ocular conditions by proper nasal treatment. I do believe, however, that an external manifestation, say an empyema that has ruptured orbitally, will certainly be treated from that point better than from the nose, or, I should say, by combined treatment, and not only from the nose.

DR. LINN EMERSON, Orange, N. J.:—It would seem to me that the man who should get these cases first gets them last. There is room for missionary work by the general surgeon. I have had a number of cases like Dr. Jobson's, and those cases do not come to me as a rhinologist, but as an oculist, and most of them come for headache to the general practitioner, who does not appreciate the condition, and after this stubborn headache and the inflammatory symptoms have not been relieved, he ultimately calls in as a consultant the oculist, and of at least twenty cases of this sort which I have seen, practically 90 per cent have been sent to me because I was an oculist and not because I was a rhinologist.

DR. H. A. BEAUDOUX, St. Paul, Minn.:—Dr. Ballenger in his remarks regarding hay fever has referred to the late Dr. Shadle, whom it is my privilege to succeed in St. Paul. This year and last year quite a large number of his patients came to me, believing that having succeeded him in the office, I had the key to the cure of hay fever which the Doctor was supposed to have established. While it is true that Dr. Shadle had relieved quite a large number of cases by irrigation of the antrum, temporarily, I have found quite a large number of these cases coming back, suffering from their hay fever just as much as they did before. Previous to the doctor's death, I had quite a long interview with him in regard to his investigation and his mode of treatment, and in a friendly way criticized his *modus operandi*. I told him that I couldn't see how he could convince the profession that the antrum was at fault, his microscopical findings were unreliable, the fluid having been obtained through the nose, and they did not differ from those found in the nose, nor had he isolated a specific germ. I think, as Dr. Ballenger pointed out, that he didn't wash out through ostium, but through accessory sinuses, except where he removed the middle turbinate. These same cases are coming back to me and are just as bad as they have been before. My experience with hay fever cases, or rather those which I have cured, lead me to conclude that intranasal surgery is our only sure way to bring about a cure in such selected cases. Those to which Dr. Ballenger referred are, in my opinion, surgical cases, but were not surgically completed. I want to refer to Dr. Reeve's method of treating the frontal sinus, i. e., simply by opening the anterior wall and either making drainage from the nose in some cases, in others closing the wound without drainage. Many of these acute cases will be found to contain a muco-plug and the patient experiencing excruciating pain; nothing but a trephine operation and the removal of this plug relieves the patient. I am therefore in favor of this external route, which is free from danger and leaves little or no disfigurement if carefully and painstakingly done with this in view.

DR. L. W. DEAN, Iowa City, Iowa:—I cannot help but briefly record a case under my observation, and one which I have carefully studied now for 18 months, and I want to report this case because it had been carefully studied, and the observations are somewhat unique. This patient

complained of blindness. Examination of the patient revealed striae in the lens. An indefinite view of the fundus could be obtained and nothing abnormal noticed. Vision was reduced to counting of fingers. There was pus present in the posterior ethmoids and sphenoid. The nasal trouble was removed. At the end of two months the patient had a return of vision. Now 18 months after the time she first came under my observation her vision is 6/9. The striae in the lens have partially disappeared. There are simply two spots left under the capsule in the anterior cortex.

DR. ROSS H. SKILLERN, Philadelphia:—I am well aware that my paper was insufficient to bring this matter before you in a clear and concise manner. My one thought was to emphasize the fact that such a disease as chronic hyperplastic ethmoiditis existed. This Uffenorde demonstrated to me by that one great argument which cannot be refuted, the microscope. I was emphasizing particularly this one polypoid condition whereby we have pressure symptoms only.

I did not have time to go into the subject of toxemia. It is of course true we do have toxemia in some conditions, as referred to by Dr. Ballenger, but in these conditions it is necessary to have purulent secretion. The severity of the toxemia usually depends upon the virulence of the infective secretion.

ATRESIA OF THE EXTERNAL AUDITORY CANAL.

EDGAR A. FORSYTH, M.D.

BUFFALO, N. Y.

Closure of the external canal may be congenital or acquired. It is not a common condition. In looking over the literature on otology, I find very little pertaining to this subject. Some of our authors make no reference to it. Bishop says records of Illinois Charitable Eye and Ear Infirmary at Chicago show only three cases of congenital absence of meatus out of 21,000 cases. Congenital atresia is usually associated with malformation of the auricle, and in most instances with malformation of the middle and internal ear from imperfect development. This internal malformation renders surgical interference inadvisable except in the simplest form where the closure is merely by a thin layer of skin. This is a rare condition, as atresia is almost always bony, and may be so complete that no sign of the entrance into the external meatus exists. The point of occlusion is most always situated at the junction of the cartilaginous and bony portion of the auditory canal. The acquired form is of rare occurrence and is the result of chronic suppuration of the middle ear, extensive ulceration, operations, over use of cauterizing agents, or caries and necrosis of the external meatus, phlegmonous and peri-auricular inflammation extending into the auditory canal. Cases have been reported following radical mastoid. Care must be exercised not to tear the membranous auditory canal from its bony attachments in this operation, as it may cause atresia of the auditory canal.

Reports of complete acquired closure of the meatus are rarer than those of congenital absence thereof.

It is well known that with bilateral atresia hearing and understanding of speech can exist. Two such cases are reported.

The occlusion may be skin, cartilage, bone or a combination of these elements, and the occlusion may be partial or complete. In cases of osseous occlusion it is never complete, as careful search will usually reveal a channel through which a fine probe can be passed.

The condition is discovered when the patient seeks relief from deafness or a chronic suppurative otitis media. They usually give a history of middle ear suppuration that has ceased to discharge and followed by deafness, or the ear may be discharging when they seek relief. There may be pain in or about the ear, com-

monly in front of the tragus, or there may be frequent attacks of earache. In some cases pus seeks an outlet through the mastoid. When the atresia is due to obstruction near the external orifice, there may be a shallow depression to indicate site of meatus.

The canal appears as a pale gray or grayish red glistening cul-de-sac. The further the atresia extends externally, the shorter the auditory canal appears. When the atresia is located at the innermost part of the osseous meatus, the surface of the growth may be taken for the membrana tympani. In such cases the poorly defined margin of the growth, the absence of the short process and handle of the malleus, and the shorter distance between the deeper parts and the external auditory orifice as compared with the other side will establish the diagnosis. By use of the probe we can ascertain whether we are dealing with a membranous, connective tissue or osseous growth. Information regarding the thickness of the atresia is sometimes afforded through the test for hearing. In an osseous or extensive connective-tissue atresia, we usually find absolute deafness or a disturbance of hearing of a high degree, often accompanied with tinnitus. In membranous atresia the hearing distance for speech may be considerable. A hearing trumpet should be used in testing the hearing, as loud speech is partly transmitted through the cranial bones. In osseous and connective tissue atresia the words spoken through the trumpet will be understood with difficulty or not at all, but if atresia is a thin membrane, soft, low speech can be well understood, providing the middle ear and labyrinth have not undergone any great change. In those cases in which whispered speech is heard through the hearing trumpet, it is quite probable that the atresia is very thin. In such cases operation is likely to do some good. On the other hand, those cases that do not hear with the aid of the hearing trumpet are not very likely to be improved by an operation. Operative procedure gives better results in acquired than in congenital form. No operation should be undertaken to correct maldevelopment of the canal unless the middle and the internal ear are found to be intact.

Schwartz holds that invariably where grave one-sided atresia is present, a maldeveloped labyrinth also exists on the affected side, and substantiates his observations by the fact that a test fork placed on the middle or the top of the head is heard only in the normal ear. When bony atresia is demonstrated to be present, surgery should be resorted to only after proving by fork test that middle and internal ear are intact. Congenital atresia involv-

ing the bone where the functioning apparatus is involved give poor results and an operation, same as simple mastoid operation, is performed, keeping the post auricular wound open to permit sound waves to reach the middle ear through the opening. This may afford relief according to Michael Jaeger. In cases of fibrous or membranous character, operation by intrameatal method is indicated. In suppurative cases best results would be obtained by doing a radical mastoid operation.

I have seen one case. On August 31, 1908, Mrs. C. L., age thirty, came to the Emergency Hospital Dispensary with history of discharge from right ear since she was teething; never had any pain, but at times discharges blood and pus profusely, some pus at all times. Speculum was not needed to examine ear as canal was closed near external opening. It looked as if closure was complete, but a small probe could be inserted into a small slit in the lower part near the floor. End of probe came in contact with bone as soon as introduced. Its removal was followed by pus and blood. She also had a large goitre. I saw no more of her. I tried to find her later and on making some inquiries found she had been operated on for her goitre and one-half was removed. She became delirious and died in a few days.

This was a case for radical operation. It was my intention of doing one on her but I only saw her once. With a history of chronic suppurative otitis media of nearly thirty years' duration, and as there was no malformation of external ear, I believe this to be a case of acquired atresia due to chronic suppurative otitis media and one in which operation would have been required.

DISCUSSION.

DR. WENDELL S. PHILLIPS, New York:—One word should be said in regard to this subject. From my experience I would state in general terms that congenital atresia of the external auditory canal of a bony character should be let alone, and that acquired atresia of the external auditory canal, as a rule, should be operated on and relieved, as the results are most favorable. I saw a case only yesterday that I operated on somewhat over a year ago, a young man who had complete occlusion of the external auditory canal, which had come on gradually. The base of the bony tissues was attached to the posterior superior osseous canal wall. So far as I could learn the cause was a suppurative process. He could hear the acoumeter at the first examination only upon contact and the whisper not at all. I made a posterior incision to the bone similar to the usual mastoid incision, pushed all the soft tissues forward, including the outer posterior portion of the fibro cartilaginous canal until the bony growth came into full view and then cracked the growth off with a mallet and chisel, replaced the soft tissues and sewed up the hurt auricular wound at its base. The man made a perfect recovery, and upon examination a year later he could hear the acoumeter 38 feet and the whisper at 20 feet.

DR. JOHN J. KYLE, Indianapolis:—To add to the literature on the subject, I wish to speak of a case I have now under observation. She has had this atresia now over a year and has so far refused operation. I did, however, succeed in cocoanizing the membrane and burning away the deeper fibrous tissue with the actual cautery and tamponing, but the results were unsatisfactory, and the only way to cure this case will be a radical operation.

DR. JOS. BECK, Chicago:—I would supplement Dr. Phillips' remarks by saying that after a thorough test has been made, as referred to in the paper, although it is not clearly stated as to the lateralization, one should satisfy himself that there is hearing present, though only slight. From my own experience I would say most of the cases had better be let alone. I had the opportunity of operating a case of microtia and obstruction of the canal a short time ago, and we found that the bony structure of the auditory canal just as far as we dared to go with any degree of safety was simply solid bone. The principle reason for the operation was a plastic one for cosmetic purposes.

DR. F. H. KOYLE, Hornell, N. Y.:—I wish to report a case of partial occlusion of the bony canal, a case of osteoma, which was cured by simply chiseling the growth. A second case of complete atresia of the entire canal—an acquired case—that came to me only two months ago. This woman told me that she had had her ear examined some years ago and was told she had a polyp in her ear. That is the only history I could get. This atresia proved to be entirely cartilaginous, and on inflating the ear, the auscultation tube showed evidence of a middle ear space. I operated and removed the cartilaginous growth entirely, but on getting into the middle ear cavity I found the drum membrane and ossicles gone and the growth to have invaded the cavity, requiring thorough curettage to effect its removal. Hearing up to this time had been nil; after operation she was able to hear watch at 14 inches. A flexible Graefe knife was used for this operation, followed by vigorous curettage of the canal and a dressing of gauze rolled into a solid plug. This plug was removed every second day and the canal further curetted for two weeks. There does not seem to be any tendency at this time of a recurrence of the growth.

DR. A. H. ANDREWS, Chicago:—I was called to perform a mastoid operation on a patient some years ago with a congenital atresia. I have not been able to complete my records, but hope to, when I may make a more complete report than I can this morning. When I cut down on the supposedly mastoid abscess, I came to the auditory canal, and found I had a case of acute otitis media with discharge into the canal which simulated a mastoid abscess. The small ear was set well forward, and the opening into the bony canal was found entirely behind the auricle. I made skin flaps and inserted into the canal and got an open meatus. Since then I have been told that the patient has entirely lost the hearing in the opposite ear and all the hearing she has, which is sufficient for ordinary conversation, is through this congenitally closed canal.

DR. W. L. BALLENGER, Chicago:—I can report one case of congenital atresia, a man 27 years of age, with microtia of the auricle. Upon applying the tuning fork tests, I found he had complete loss of bone conduction in the affected ear, with lateralization of sound to the unaffected ear. He came to me to have this ear opened, but I advised against operation.

I saw Dr. Whiting a few years ago operate upon a case of acquired atresia, in which the skin was apparently as intact as in the case of congenital atresia. But, the history of the case showed that she had heard in that ear one time, and many years ago had had a suppurative process. The doctor opened down on that ear with great difficulty, but very care-

fully and very successfully. I don't know what the hearing has been since. He operated as for a mastoid disease.

I have had two or three cases of acquired partial atresia following mastoid operation which required a reopening of the wound and removal of fibrous tissue which had formed at the bottom of the canal. The atresia was due to faulty handling of the plastic flaps. I used to have some difficulty with this part of the operation. The lower end of the flap would become loose and gradually obstruct drainage and perpetuate the suppurative process, which was later relieved by operation. I don't quite understand Dr. Andrew's case. I would hardly expect the patient to have hearing in congenital atresia, because the labyrinth is usually not developed in congenital cases. But, if this is a congenital case, it is certainly a very interesting one.

DR. STEIN:—Doesn't Bezold claim the labyrinth is in a good condition in all cases of congenital atresia, Dr. Ballenger?

DR. BALLENGER:—In the case referred to the labyrinth was absent.

DR. JOS. BECK:—Hartman reports three cases of congenital atresia operated on with good recovery of hearing, so that there is in a good many cases a good remnant of hearing present.

DR. J. C. McALLISTER, Ridgway, Pa.:—I had a case of congenital atresia about a year ago with microtia. I was not familiar with the literature, and I advised non-interference. The question came to my mind as to the condition of the labyrinth, or, especially, the middle ear. I speculated on the possibility or probability of suppurative otitis media in that child later on. I have not been able to find any clear statement as to that in my literature. It must be evident to every one of us that when the middle ear is intact and perfectly formed, that the child is practically as liable to suppurative otitis media as when the external ear is normal. My advice to the people was this, that in case the child should be apparently having an earache or any trouble with that side of its head to report to me immediately.

We don't see many of these cases, and I would be glad if some one would elaborate that phase of the subject a little further.

DR. KATE W. BALDWIN, Philadelphia:—I have had two cases of complete congenital atresia in adults, one of which was by bone and soft tissues. By opening and dilating was able to get a very small canal, but the results were so poor that we decided it was better not to interfere with the bony obstruction. The other case had been twice operated on by one of our very best operators. There was no hearing in the ear, and I advised her not to do anything with it.

DR. COLLINS, Charleston:—I want to report a case of double atresia in an infant a few months old, in which, at the earnest solicitation of the parents, I did a tentative operation to see if anything could be done. I found the bone solid, but a depression where the canal should have been. An operation was done for cosmetic purposes, but without success.

DR. E. B. GLEASON, Philadelphia:—Congenital atresia, especially where one ear only is affected, had better be let alone. There is, however, one class of cases where the history indicates a congenital origin which are simply exostoses, not extending far down into the canal. Sometimes exostoses extending only a short distance can be demonstrated with a probe. The X-ray under such circumstances gives a good diagnosis of the case. Now in some of these exostoses of the posterior wall of the canal—they are usually posterior—the operation is a very simple one. A blow or two upon the chisel will split your growth off from the posterior canal, and beyond that you will have a normal canal, ordinarily filled with debris of one kind or another, and the drumhead intact beyond that.

I have had two or three, perhaps more cases of that character operated on successfully. I have met with one case, the history being that of congenital atresia, that I operated upon; the bony growth in this case extended clear down to the drumhead. I was unable to demonstrate its character by means of the probe; it was a great many years before the advent of the X-ray, and in this case I turned the auricle forward and did practically a semi-radical mastoid operation. The results, however, were far from satisfactory, and there was not a very great improvement in hearing.

In acquired atresia of the canal, where the atresia is membranous in character, the operation to be done should be plastic. Unless you insert some sound skin your results will be far from satisfactory ultimately. I have had one case operated on elsewhere, where the operation apparently consisted in an excision of the membranous atresia, which was successful for the time being, but which ultimately, perhaps six months or a year, resulted in a complete return of the atresia. Better results, unless you do a somewhat extensive plastic operation, are to be achieved by the wearing of lead styles, the surgeon making the styles himself, and gradually increasing their size until finally you have got a satisfactory opening into the canal.

DR. RYERSON, Toronto:—Until about six weeks ago I never saw a case of microtia with good hearing. In Barany clinic, Vienna, I saw a case of microtia in which the patient could hear the whispered voice at eight feet. The sound side was closed by the Barany "Lärm" apparatus, so that there was no room to doubt that he had heard with the microtic ear.

DR. PHILLIPS, New York:—This discussion should not be allowed to close without definitely bringing up one or two facts. In the first place, we ought to distinguish between membranous and bony occlusion. Then differentiate exostosis of the canal and congenital bony occlusion of the canal. Congenital bony occlusion of the canal, in my judgment, is not relieved or benefitted by operating, except in rare instances wherein there is still some drum membrane behind the occlusion. But acquired exostosis of osseous external canal from any cause can be relieved by operation and the patient's hearing restored. In my judgment an exostosis of any considerable age should be removed by a posterior incision; because, in operations performed through the meatus, atresia of the soft tissues is liable to ensue. As to membranous occlusion, those cases are amenable only to treatment by a radical operation and by making a flap exactly as in the radical mastoid operation.

I had hoped that in this discussion there would be nothing said about stretching the external auditory canal with tampons, because no permanent benefit is secured by any form of tamponing.

DR. GLEASON, Philadelphia:—In regard to this style case, the obstruction was membranous. It was peculiar in that it was a cholesteatomatous case, for which no operation had been done, because the patient refused operation, and in which there was a large collection of cholesteatomatous material which required removal from time to time. Operation for the atresia had been performed in Baltimore and was a failure. Afterwards the case had been dilated with lead styles before coming into my hands, to the extent that there was relief for a number of years. The atresia had partially returned. The treatment with the lead styles was continued in my hands, after the patient absolutely refused operation, with very satisfactory results indeed. Possibly the large cavity in the middle ear, occupied from time to time by cholesteatomatous accumulations, may have contributed to the good results, and also the fact that the atresia involved a comparatively small portion of the canal.

THE COMPARATIVE MERITS OF THE METHODS EMPLOYED IN THE VARIOUS MASTOID OPERATIONS, WITH STEREOPTICON DEMONSTRATION.

JOSEPH C. BECK.

CHICAGO.

Having been assigned by the Chairman to present the subject of "Comparing the Merits of the Methods Employed in the Various Mastoid Operations," and drawing my conclusions therefrom, I have decided to limit myself to three principal operations, namely:

- a. Simple mastoid.
- b. Semi-radical.
- c. Radical mastoid.

The various complications, as labyrinthitis, sinus thrombosis, meningitis and brain abscess will not be discussed within the limits of this paper.

I desire to state that my conclusions are based on personal observation and experience only; consequently, there are a number of methods and modifications of the technic that will not be mentioned, not having employed the same, or if so, not often enough to have drawn any conclusions from them.

It is not necessary for me to describe before this body of specialists the usual technic of the various operations, inasmuch as that would be repeating what is well known, or can be found in any modern text on otology. What I desire to do is to bring out the salient points in the various steps of the operations, their modifications, criticize them and mention some steps in the technic that I have been employing with good results, which perhaps are new and may be of interest.

PREPARATION OF PATIENT.

After the usual shaving and scrubbing of the field of operation, it is the custom to cover the head with towels, rubber or cloth caps, all of which are easily displaced during the operation and permit the constant annoyance of the hair being too close to the operating region. In order to overcome this difficulty, especially in women, I have been employing a starch bandage which is applied in a wet condition, usually the day before operation. After the patient is partially anesthetized, that much of the starch

bandage is cut away as was hair shaved off the mastoid region. In front of the auricle and down on the neck a piece of adhesive plaster is applied to further insure its retention; or I frequently apply the Backhouse clamps, which pinch the skin and bandage at the two or three points and at the same time holding a sterile towel. Prior to making the incision I have been employing for over a year the application of tincture of iodine solution over the entire field of operation without first scrubbing and washing with soap and water, this having been done the day before. The purpose of this application, according to Prof. Garrell of Feumé, Italy, who has employed it in several hundred various surgical operations, is that it sterilizes the skin, penetrates into its deeper layers, and thus prevents stitch abscess and skin infections.

(a) *Method of Illumination*.—In comparing the value of the various means employed to illuminate the field of operation, one must state the kind of mastoid operation one is doing. In the simple mastoid one may get along very well by direct daylight illumination, or the ordinary artificial light of the room. The better light is an 8 or 16 candle power lamp, hooded and fixed to a head band such as the Stuckey, Murphy, Pynchon and others, all based on the same principle. The semi-radical and radical operations, in fact wherever one must be able to illuminate depths and to focus them, then reflected light is preferable. Kerstein's mirror of the latest pattern is the best instrument for that purpose, although it becomes very tiresome to operate at great length with this mirror on. The Clar light is not bright enough. A good substitute, in fact probably to be preferred to any other method of illumination for any kind of mastoid operation, is the ordinary head mirror and the 50-candle power lamp, stereopticon style, as the source of light. This is placed into a swivel socket on a flexible cable bracket by means of a clamp which may be attached anywhere. The best place is on the corner of the operating table, and usually on the same side on which the operation is being performed.

(b) *Operating Table*.—The head rest, which is curved in conformity to the head and neck, is so constructed as to be elastic enough to give sufficiently to relieve any concussion while using the hammer and chisels.

(c) *Instruments*.—There is a usual set of instruments for every kind of mastoid operation, because even if one only intends to do a simple or semi-radical, one may find pathological conditions that one should be ready to do much more radical measures. I will say that it is best to have as few of them as possible near

by, and the special ones on another table, which the nurse may hand over when needed, the same as she does suture material, solutions and dressings. I believe that as a rule the operator, first assistant (and it is best to have only one assistant), should handle their own instruments rather than call for them, since much time is saved thereby. The nurse is to clean and to replace them each time that they have been used. The arrangement of the instruments is as follows:

TABLE I.

2 Knives.	1 Motor with Cable and Handle.
12 Ochsner Artery Forceps.	8 Various shaped Drill Points.
2 Periosteotomes.	1 Hand Burr.
2 Scissors, one straight and one curved.	2 Plain Retractors.
2 Allport Retractors (Jansen's).	2 Fine Gouges and Chisels for labyrinth operation.
1 Mallet.	1 Jansen Rongeur.
4 Gouges.	1 Fine Ossiculectomy Forceps.
4 Chisels.	2 Kerrison Forceps.
3 Curettes.	1 Cozolini Forceps.
1 Rongeur.	1 Small Curette with Long Shank for Eustachian Tube.
2 Blunt-pointed Probes.	1 Skin Graft Carrying Probe.
1 Angular Dressing Forceps.	1 Siegel's Speculum.
1 Anatomical Forceps.	1 Aneurysm Needle.
1 Rat Tooth Forceps.	

TABLE II.

12 Needles.	Split Rubber Tubing.
2 Needle Holders.	Pinwheels.
1 Michel's Outfit, for Metal Clip Sutures.	Sponges, small and large.
Silk Worm Gut.	Dressing Pads.
Catgut.	Bandages.
Silk.	Pins.
Horse Hair.	Adhesive Plaster, Corset Dressing.
Adrenalin.	Beckhouse Clamps.
Tincture of Iodin.	Towels, etc.

I have simply mentioned those instruments and supplies required at the operation that I use, and not attempting to compare other instruments which I have used, since that would require very much time and would not be of very much value. After all, if the instruments are in good order, anyone who has surgical ability can use almost any kind of instrument usually employed.

ANESTHESIA.

The most frequently employed anesthetic, ether, is by far the safest, but to my mind the most irritating and objectionable to the patient. I wish to say further that the only death that I ever saw, most probably due to the anesthetic, was when ether was employed in a mastoid operation; and on several occasions I

have seen quite marked respiratory collapses when ether was given. The general cry against the use of chloroform has prejudiced me against using it very often, so that I cannot say very much about it, but I distinctly remember that formerly when I did use it the anesthetic appeared much more satisfactory all around.

There are two methods of anesthesia in mastoid surgery which I wish to mention as having given me excellent results:

Nitrous Oxide and Oxygen Mixture.—This is administered by means of the handy Teter apparatus, by an expert anesthetist. In all cases where a general anesthesia of chloroform or ether is contra-indicated and a local infiltration anesthesia is impossible, the nitrous oxide oxygen is certainly an admirable anesthetic. In fact, if one has such an apparatus, and a trustworthy anesthetist who understands the management of the same, one would do well to give this anesthetic in every case. I have employed it in a case of sinus thrombosis following scarlet fever, in which the mastoid operation, cleaning out of the clot, ligation of the jugular and resection of the same was done with absolute anesthesia of the patient. The boy had a nephritis and capillary bronchitis as well as an anemia which would not permit any other anesthetic with any degree of safety.

The second method of anesthesia that I wish to mention is the *local or infiltration anesthesia*. Schleich, Neumann, Day and others have reported excellent results when employing the same, and I wish to add to my report that it was at first a revelation and always a great satisfaction to have operated under this form of anesthesia without any pain in the majority of cases. There is one instrument that enables one to do so much on the bony structure without pain under local anesthesia which I desire to mention here, although taking it up in another part of the paper, and that is the electric drill. The hammer and gouge or chisel are very unbearable to a patient under local anesthesia. In the past four months I have employed the method of infiltration anesthesia as recommended by Braun. After making the usual Schleich subcuticular infiltration, the further technic consists in injecting a solution of novocain five parts, adrenalin (1/1000 Sol.) three parts, in 97 parts of normal solution in the very region of the sensory nerve at the external auditory canal, middle ear and mastoid region, as one does in injecting alcohol in the very vicinity of the tri-facial nerve in tic doloreaux. This is also known as the Block method of anesthesia.

SIMPLE MASTOID OPERATION.

Based upon the information gained by the radiogram, I wish to state that not in one instance have I been misled by it, especially as to the anatomical outline. I believe that in every case of acute mastoiditis that has to be operated on, one should remove every cell thoroughly no matter how far they extend. The simple decortication or only opening down to the antrum is not good surgery. Not only should the antrum be opened wide, but it should be curetted of its diseased membrane and its cicatricial obliteration expected. There are cases without number that have had no other treatment than a Wildes' incision or decortication of part of the mastoid process, that recovered, some permanently, especially in children. However, there is too great a danger from recurrence or perpetual discharge from the retro-auricular fistula and middle ear to even think of such a conservative treatment. My contention, therefore, is to eradicate all the cells up to the additus ad antrum and not to expect any resolution of the suppurative process in these structures. I recall several cases treated by the so-called conservative method, especially in children, that had been healed for some time, which did, following an acute rhinitis, return with a swelling in the retro-auricular region which had to be opened and cleared of its pus. If this recurrence follows soon after healing has taken place, then the symptoms are very slight and spontaneous rupture follows. If, however, some time has elapsed, then much graver symptoms are manifested.

Last October at the Austrian Otological Society this subject came up for discussion, and Neumann, Politzer, Frei, Bondy and Briel all expressed themselves of the wisdom of the complete eradication, including the antrum, finding that then bone infiltration can follow and prevent recurrences. I desire to state in this connection, that I believe that regeneration of bony structure in the exenterated mastoid cavity depends upon the preservation and proper suturing of the periosteum, the use of the curette rather than the burnishing process by the burr, and possibly the filling of the cavity with blood clot, or, better still, bismuth paste.

Incisions.—The usual incision begins on the level of the upper margin of the auricle, carried on in a curvilinear direction, a little below the tip of the mastoid process, one-fourth of an inch from the insertion of the auricle, is sufficient in the majority of the cases. It can easily be extended forward above and downwards below as pathological conditions may require. Should

the pathologic condition, however, be more extensive, as, for instance, a sinus thrombosis, then an incision allowing greater exposure will become necessary. Of the incisions I have employed, namely, the Zaufal and Whiting, will say that the latter gives a greater area of exposure, but two flaps are less desirable than one, on account of the formation of a visible scar; and, therefore, the former is preferable. In order to combine these two good points of the two variety of flaps, I have devised and employed a tongue-shaped flap which is made after one finds that the usual incision *a* will not suffice. Continuing the incision from before backwards over the occipital region as illustrated in *d*. This incision is entirely hidden in the hairy parts after union.

In all these incisions one should be careful to preserve the periosteum while separating it in the operation.

Hemostasis and Retraction.—Since hemastatic forceps are in the way and prevent the proper retraction of the tissues, a method to control the bleeding and retract the tissues is very desirable. We have been fairly successful in doing this by the aid of the Allport retractors. There are times, however, no matter how accurately the retractors are put on, that some oozing will still continue, especially from the skin vessels. In order to stop this annoyance I have been employing an instrument, long known as an angiotribe, devised by Blunk. I find it to be good. The technic is to grasp the bleeding point with an artery forceps, and then, instead of a ligature, pass the instrument over the tissues and squeeze them. This procedure destroys the intima and closes the vessels. I desire, however, to say that this instrument is not to detract one particle from the value of the Allport retractor, or any of its modifications as a hemostat and retractor. I prefer the Jansen because it is more powerful.

Decortication and Exenteration.—In the simple mastoid I prefer removing the cortex of the mastoid by the aid of the gouge in preference to burrs or other drilling instruments except under local anesthesia. Comparing the various methods employed in the exenteration of the general mastoid cavity, after the cortex has been removed by the various gouges and chisels, one must consider the kind of mastoid bone we have to deal with. In the pneumatic variety, or where there has been a great deal of softening and destruction going on, the use of the curette is very satisfactory.

In the deploeic or sclerotic variety the use of the electric drill is superior to any other method. In the past two years I have employed the electric drill in many cases and have been

very well satisfied with the results. I desire, however, to record an observation I have made in a number of instances in the healing or regeneration of the exenterated cavity following the use of the drill. It is this: The smoother the cavity, the slower was the growth of the granulation and obliteration of it, and subsequent radiograms taken of such healed mastoids showed a great deficiency in the bone regeneration as compared with radiograms wherein the curette was employed; or, in other words, where the cavity was not so smooth. This has already been referred to in another part of the paper. This observation is also important in connection with the Heath, as well as the radical operation. Only, in these cases is it beneficial not to have large granulations form and epidermization can take place more easily over a smooth surface. What the cause of the retardation of this repair process of bone is, I have not been able to find out; neither is there anything on the subject in the literature. It may be that the great heat generated by the electric drill is injurious to the bone.

There are cases of acute mastoid exacerbation of a chronic suppuration that have a completely eburnated mastoid tip; and in such cases it is very difficult to decide the extent of the exenteration to be performed. The reason for that is this: All one can hope for in the healing is a reformation of this already present bony structure; therefore, one might hesitate to remove it. Nevertheless experience has taught us that oftentimes, at the most extreme tip of the mastoid, there are found cells of considerable size which are infected and cause trouble. It is, therefore, best also in these cases to completely exenterate the entire mastoid, and the burr is the best instrument to employ in such cases.

Primary Dressing of the Cavity.—This will depend, of course, a great deal on the kind of cavity one has to deal with after exenteration.

1. In case the sinus, dura, facial nerve or labyrinth have been exposed by the diseased process or accidentally during the operation, I usually employ the spiral split rubber tube leading up to the bottom of the antrum and the remainder of the cavity is then filled with gauze (pinwheels). If, however, none of the above mentioned vital structures are exposed, then I employ these various methods:

2. Same as if exposure of the above mentioned structures was present.

3. Fill out the cavity loosely by gauze.

4. Fill the cavity with bloodclot and employ silk worm gut as drain.

5. Fill cavity with bismuth paste No. 2 (bismuth subnitrate 30 parts, vaseline 60 parts, white wax (120 degrees melting point) 5 parts, and paraffin 5 parts), and employ silk worm gut strain as drain.

The comparative merit of these different methods will be discussed when I consider the suturing of the wound.

Methods of Drainage.—We may drain through the incision, usually at the lower angle. Or, uniting the incision in its entirety, drain through a separate small opening externally and below the incision. The comparative merits of these two methods, from my personal observation, is that the separate drainage opening, uniting the incision primarily, is much to be preferred, owing to the rapid healing taking place. Stitch abscesses are less liable and also less deformity with scar formation. Of course, if the process is of a very septic nature, one will choose a larger and freer drainage. In such cases I usually drain through the lower portion of the incision.

Method of Closure of Incision.—1. Deep and superficial silk worm gut sutures placed interruptedly are the most frequently employed. The objection to the deep suture is that it cuts into the skin and causes scars which are visible for some time. In order to overcome this difficulty I interpose a small roll of gauze after the skin has been brought together by a few superficial stitches over which the deep sutures are tied.

2. The Mishell metal clasp sutures have been employed considerably in mastoid surgery on account of the ease and rapidity with which one can close the wound, and I believe them very serviceable for superficial sutures; however, they will not take in the periosteum, especially when there is considerable infiltration about the tissues. Again, puncturing the skin as they must, there is a great liability to stitch abscess formation.

3. Deep catgut sutures and superficial silk or horsehair, either continuous or interrupted, I have employed many a time, and, next to the suture that I am about to describe, have found it the most satisfactory.

4. In all cases where the primary incision is closed and a separate opening for drainage is established, I employ the following sutures, being the simplest and most satisfactory method of suturing I know of.

Technic.—The needle is first made to enter the skin at the upper angle of the incision, slightly to one side, thence carried

through all the tissues, including periosteum, now taking a firm hold with tissue forceps of the periosteum of the opposite side, the needle is passed through it from within outward. Crossing again over to the opposite side, the periosteum is taken in, sutured; this is repeated back and forth in a spiral manner until one reaches the lower angle of the incision, when the needle is made to come out through all the tissues, including the skin, slightly to one side of the incision. When the two free ends of the incision are drawn taut the periosteum is brought closely together for union. This is important when, as mentioned before, future regeneration of bone within the mastoid cavity, or at least its cortex, depends on the preservation of the periosteum. The second part in the technic of this suture is that, first, recommended by Halsted (Baltimore) in cases of hernia and other abdominal operations, and since then used in many other localities. It is known as the continuous subcuticular suture.

The needle is made to enter the skin opposite the periosteal suture in the upper angle of the wound and slightly to one side. Its course is the same as the periosteal suture, excepting it only takes hold of the subcuticular connective tissues, emerging again opposite the lower end of the periosteal suture.

By grasping the upper and lower suture of both the periosteal and subcuticular sutures and drawing them taut, all the tissues come in close proximity with the margins of the incision, slightly overlapping. The upper suture ends are now tied over a small roll of gauze, while the lower are firmly held by an assistant and then tied in a similar manner.

The removal of the suture at the end of a week or ten days is very simple. Cut off both upper ends just below the roll of gauze, both sutures will come out with perfect ease and without any pain, leaving an excellent union with the possibility of an irritation from the upper and lower suture points.

In briefly recapitulating the subject of primary dressing, method of drainage and suturing of the wound, I will say that filling the cavity with bloodclot, bismuth paste, strands of silk worm gut, rubber tube and gauze as drainage through a separate opening and uniting the incision by means of the double spiral periosteal subcuticular suture has given me the most satisfactory results for obtaining a more rapid, permanent healing, cessation of discharge from the middle ear by way of the auditory canal and closure of the perforation, early recovery of hearing and practically no deformity in either the scar formation or bony depressions.

Radical Mastoid Operation.—In the radical mastoid operation the comparison of the methods of procedure are practically the same as in the simple mastoid operation up to the point of completion of the latter. I desire again to call attention to the value of the radiograph before operation as to the anatomical configuration as well as the pathological processes that may be present.

Removal of Posterior Canal Wall.—The membranous portion is bluntly dissected and torn away at its innermost extremity, as the use of any knife such as recommended by Stacke and others is of very little value. The outer two-thirds of the bony canal wall should be removed to its full extent, flushed with the floor and roof of the canal, and but a slight lip allowed at the lower internal margin where one approaches the facial nerve. The usual method of procedure is to wait with the formation of the plastic flaps until at the close of the operation. However, I have been making the flap just as soon as I have removed enough of the posterior wall of the bony canal to enable me to do it. The reason for so doing is that I obtain a much better field for operation and observation of the structure within the canal, besides not needing a special retractor, which is only in the way and may injure the tissues. The method advocated by Holmes, to employ a strip of gauze tied over the loose membranous canal and drawing it forward is very serviceable, but will frequently tear it in an undesirable place. I believe this to be a matter of personal preference and not of great value. It is just what flaps we are accustomed to making which we prefer. I have for several years employed the Panse flap with satisfaction, but in the past year I employed the Siebenmann flap. The advantage I see over the other flap is that there are three points for epidermization, and the little center flap, when drawn back, fills up a gap that frequently is the seat of a dead space, where secretions and granulation form for some time after the operation. Aside from this, the external meatus is not made unsightly, as happens from other flaps.

As soon as these three flaps are made and superfluous cartilage removed, I pass a silk worm gut suture subdermally through each and jointly pass the threads into the external auditory canal. By drawing these threads forward a perfectly free auditory canal is obtained.

A small tampon, saturated with adrenalin, is introduced against the perforated drum membrane and into the deepest part of the antrum. The method of procedure is to trim down the

facial ridge. I prefer the burr to the chisel. It is safer in those hands who are accustomed to using this instrument.

In speaking of the bone formation, or the apparent lack of the same in the acute cases where the burr is used, I wish to say it has been my observation that the smoother the cavity in the radical or semi-radical operation the better did the flaps heal in and faster did epidermization take place. Or, if secondary skin grafting was done, they took better. I may say right here that I never do primary skin grafting of the cavity any more, having had no results from the method. (The two little tampons are now removed.) The last part of the external wall of the auditus, as well as the malleus and incus, are to be removed, and I believe that in this part of the operation, more than in any other, do the two methods stand out for comparison. The use of fine chisels should become an obsolete method in the presence of the Kerrison forceps, or some of the modifications of that principle. The simplicity and safety in the use of this instrument is to be highly recommended. I frequently remove the malleus before removing the external wall of the auditus, and after that the incus, exercising great care not to disturb the stapes. The thorough removal of the external attic wall, what is known as the superior lip of the auditory canal, is of the utmost importance. I have employed the method for its removal as recommended by Allport, namely, by the aid of the burr in preference to the chisel. The further trimming of the facial ridge, especially that part just below the horizontal semi-circular canal, I prefer doing with the fine chisels or curettes of Richards. A tampon saturated with adrenalin solution is inserted into the entire exenterated cavity and allowed to remain a few minutes. Following its removal, a thorough inspection is made for any foci of necrosis or fistula through the tegmen, towards the sinus, facial nerve canal and labyrinth. For this purpose I employ a magnifying lens (Siegel's otoscope), and if any such condition is discovered, and it is decided to make further exposure of these various areas, it is done. Since, however, this subject is outside of the province of this paper, it will not be taken up for discussion.

The very important part of the radical mastoid operation, and from which I believe still very unsatisfactory results are obtained, is the closure of the tympanic end of the Eustachian tube. The method of curettage, as far as one can pass towards the isthmus, is the one most frequently practiced.

The use of a small hand drill, as recommended by Whitehead, is very excellent. A method recently advocated by Allport of employing the electric drill I only wish to mention, as I have only made use of it a few times.

The introduction of a slender electric cautery point and burning the mucous surface, as well as the application of strong caustics, like chromic acid, are methods not employed very extensively at the present time. The retaining of a portion of the tympanic membrane as a graft, recommended by Heine, has been absolutely valueless in my hands. One can easily explain the failures, since the surface of that structure is lined by epithelium and cannot adhere to a granulating surface. Others have recommended the placing of small skin grafts over the mouth of the tube, but I found this procedure not of much value in obtaining a closure of the tube. What I do is to curette the tube thoroughly, followed by the use of Whiting's hand drill, use a small tampon compression in the tube for a few moments, and on its removal immediately place a small skin graft, taken from the patient's arm and applied over the raw surface like the finger of a glove. This is accomplished by taking a probe, whose end has only four very fine sharp teeth, so short as not to penetrate the thickness of the skin graft, yet preventing it from slipping off. The graft is placed with the dermal or epithelial side towards the probe, stroked smoothly along the shank of the probe, thus exposing its subdermal structure, which comes in contact with a curetted area. This graft is pushed into the tube about an eighth of an inch and its free margins are smoothed out like a microscopical specimen over the anterior region of the middle ear. Against this is placed a small piece of gutta percha, which is further fixed by small gauze tampons. At best but a small portion of cases remain closed, and, I believe, if one could prevent the physiological action of the tube in swallowing, breathing and other activities of the palatal muscles, thus preventing the air from rushing into the middle ear, most of these tubes would remain closed after operation. In the last two cases I blocked the anterior nares so as to make the patient practically a mouth breather by means of Bernaz's splint material, caused them to swallow as little and as lightly as possible, feeding them principally by rectum for the first twenty-four hours. One must also bear in mind the ease with which one can cause minute fracturing of the orifice of the tube or unnecessary traumatism in this locality. Again, we know that the little Koerner cells are located around the orifice of the tube, which may

be infected and not explored. All these conditions may be responsible for the continuation of suppuration from the tube after operation.

The second method I tried in a case that resisted all manner of treatment, is one that really is not within the confines of this paper, since it is a procedure performed independently and subsequently to the operation, and only when the usual method fails. It consists in the following technic: Thoroughly cocainizing the nose, post-nasal space, oropharynx and soft palate with a 20 per cent solution cocain, injection into the tube itself of a 5 per cent cocain solution, to which are added a few drops of adrenalin by means of a Eustachian Weber-Lihel catheter.

Fixing the soft palate in the manner described by Dr. Pynchon, by drawing a rubber cord through each nostril and bringing the ends out of the mouth, drawing them under the loop in front of the septum and back of the occiput, then tied or fastened by a forceps. The patient's head tilted far back in a sitting position, a laryngeal mirror, size 22, presents the Eustachian orifice of the pharyngeal end. By means of a small knife, which is bent in such a manner as to introduce it into the Eustachian orifice and pass upward, forward and inward, as far as the isthmus, drawing it out, it is buried into the tissues and cuts through the entire thickness of the mucous membrane anteriorly. A similar knife, only bent in the opposite direction, is introduced in the same manner and withdrawn, cutting through the posterior surface of the tube. A third knife, which is in the shape of a hoe spatula, is now introduced into the tube as far as possible and a circular incision is made by it. Without first removing it, grasp the anterior portion of the mucous membrane lining the tube, and by short strokes this is dissected off and drawn out of the tube. A fourth knife, same shape as the third, but bent in the opposite direction, is introduced in exactly the same manner as the former, only its cutting edge is turned posteriorly, and by the same maneuver the posterior lip or flap of the mucous membrane of the tube is dissected out. These two flaps, anterior and posterior, with their raw surfaces in opposition, are grasped by my angiotribe and crushed close to the orifice of the tube.

We now draw back the three sutures that hold the flaps and replace them in their respective positions above, below and in the center, external to the incision, not tying until the incision is closed. The use of catgut to suture the flaps subcutaneously I have discontinued, owing to having another substance subject to infection and hidden. The simple placing back of the flaps

without suture, especially the upper, and only packing gauze against it, is likewise not satisfactory, because being easily displaced. The incision is now closed in the double figure eight form and tied, following which the three flap sutures are tied over gauze rolls.

The primary dressing of passing a split rubber tube as far inward as possible and allowing the remainder of the cavity to be filled with blood, is the method I have most frequently applied and with excellent results. It is to be preferred to the method of packing the cavity with gauze, even if it be saturated with vaseline. Recently a number of authors have advocated the simple bloodclot dressing, without any drainage whatever, and from what I have been able to observe in three cases in which I have employed this method, I believe it will become popular.

While experimenting with the bismuth paste last winter, I employed it as a primary dressing in radical mastoid and have found it an excellent and simple method. However, an experience which I had in one case, the assistant not holding the tissues firmly over the mastoid, and thus permitting the paste to infiltrate the loose tissues, caused me to give it up and not employ the paste until a few days later when thorough adhesions have replaced the severed tissues.

Semi and Radical Mastoid Operations.—In comparing the various semi-radical mastoid operations I desire to mention the procedure as suggested by Stacke, which consists in taking away the upper posterior wall of the auditory canal at margin of the anulus tympanicus and working outward and backward until the antrum is reached. The parts are curetted and a Stacke's plastic flap made of the membranous canal. The auricles may or may not be removed. About ten years ago I performed this operation with the suppuration process, but had to do radicals in the cases subsequently to obtain the best results.

At the last meeting of the Ohio State Medical Society, Dr. Iglauer presented a method of entering the mastoid antrum by way of the external auditory canal and working forward and upward toward the attic, and eventually backward into the mastoid process. This procedure is done by the aid of an electric burr and is shown to be very easy indeed of execution. It is particularly adaptable in the diploeic variety of mastoid process, and in children, where the sinus is located close to the auricle. While my conclusions at this time as to the value of this procedure cannot be considered of much importance, having employed it in

only five cases, I wish to say, that in all cases where the radiogram shows a diploeic mastoid present, I shall attempt this procedure. My results in the five cases referred to have been very satisfactory in each instance, although in three of them I performed the radical mastoid, having found pathological changes in the auditus and close to the annulus which did not warrant anything less formidable.

The interest manifested in the recent writings concerning the so-called Heath or meato-mastoid operation have prompted me to perform the same, but my results at this time are not very encouraging. It might be held against me for the manner in which I have previously expressed myself in discussing this subject, as I was very enthusiastic about it at first. This was due to the fact that in the first two cases the results were startling and have remained so, but in the other 26 cases I have been disappointed. Eight are still under treatment, having suppuration from the attic, and seven have been re-operated and have healed, excepting some tubal leakage. The remainder of this series have disappeared from observation. Almost every case was much improved after operation, but not for a very long time. The two cases which healed and remained so were children, 7 and 10 years old, in whom complete cessation of suppuration occurred, with complete healing of the tympanic membrane, and almost normal hearing. These were cases which had been suppurating for several years, both following scarlet fever. The perforations were central and of fair size.

From the statement of the foregoing facts one may conclude that I would not perform or advise the operation. This, however, is not the case. I shall continue to do it in selected cases which will be principally in the young where central perforations exist, which have resisted all local measures of treatment; particularly, if the hearing is fair and where both ears are affected. A clear statement to the patient that perhaps a second operation will have to be performed in order to secure a dry ear is imperative. One can only state that this second operation is a much simpler and shorter procedure, although I would not advise, as some have, the second operation under local anesthesia, unless it is specially indicated.

The technic is too well known to repeat and the procedures, which I have mentioned in the radical up to the point of removal of annulus tympanicus of the upper posterior portion extremely internal end of the external auditory canal, and the osseoclectomy, are the same; the plastics and closure of the wound, as well as

the dressing are similar. However, there is one deviation which I have practiced which I desire to mention: Instead of employing the cannula for inflation I have lately used the bismuth paste with satisfaction. I do not believe it advisable to blow air into loose tissues, possibly causing emphysema. The complicated and detailed manipulations of the adhesions of the ossicles and perforation, as recommended by Heath, I have never practiced, as I believe that undue manipulation of these delicate structures would possibly defeat the purpose of obtaining normal or good hearing. It must also be mentioned that a similar operation had been done for some time by Jansen and others, but Heath caused the interest.

As to the other methods of semi-radical procedure, one must mention the removal of all the structures as in the radical except the ossicles and not destroying the membranous auditory canal. The cavity thus created is drained retro-aurally until healing takes place by granulation. I performed this operation about ten years ago and is now obsolete and is mentioned for that reason.

DRESSING.

A good firm mastoid bandage is something that the average assistant or interne does not know how to put on. The majority of them are off before the patient has come out of the anesthetic. Most of the time the bandage is carried about the neck and under the chin, which is absolutely unnecessary and very disagreeable to the patient. The bandage which I employ I am pleased to call the one-hand twist bandage, which means that the entire bandage is applied without changing it from one hand to the other and is constantly reversed. The fixation points are the forehead and below the occipital protuberance. For the past six months I have been employing a dressing which was first used by my brother, Dr. Carl Beck, and described by Dr. Carl F. Weinberger, as applied in laparotomies, etc. It is known as the modified corset dressing. It is made of adhesive plaster, with a row of ordinary shoe hooks being inserted near the edge, so that two strips placed opposite each other can be laced over a dressing or pad. One strip is applied over the forehead and the other is split, one end applied over the neck and the other over the back. The advantage of such a bandage is that it is light, the dressings are easily changed and the patient does not need to be very much manipulated. Benzine is used for its removal.

In conclusion I wish to say that the after-treatment, which is of the greatest importance, especially in the semi-radical and radical

methods, has also many varieties, and a comparison of them would be of considerable interest, but the same are beyond the confines of this paper.

Note.—The article was extensively illustrated by lantern slides.

DISCUSSION.

DR. W. L. BALLENGER, Chicago:—I am in hearty accord with most of the points made by this speaker, and in the simple mastoid I have been making complete exenteration for a number of years, though many have advised against it. I am glad to have Dr. Beck give his authorities in support of this view. The use of the electrically propelled burr, I think, is a bad thing in mastoid work. I have tried it and many men have recently adopted it. I think it makes a nice wound, but not a good wound. I don't know why; it may be the temperature, for the burr becomes heated and it will burn the bone. The choice between a hand burr and a hand curette it seems are one and the same, but I differentiate between an electrically propelled and a hand burr.

In the radical operation it seems that Dr. Beck has touched upon the real cause of failure. I have in my text-book, as well as in articles, called attention to the cause of failure, namely, neglect of disease in the upper pharyngeal space or contiguous parts. Most mastoid cases have adenoids. You can often remove a comparatively large mass of adenoids from the upper pharyngeal space. Dr. Logan Turner called attention to the fact that adenoids persist in adults. Hence we find adenoids present in nearly all cases of mastoid abscess. You should not do a mastoid operation without determining if adenoids are present. They have been found very frequently by me. I remember some old cases which persisted in discharging two or three years after the radical method, in which my assistant called attention to the fact that a patient had adenoids. They were removed and the discharge ceased. They were old, chronic cases. So I believe adenoids are often present, a fact I have demonstrated to my own satisfaction, in children as well as in adults, with suppurative otitis media.

Then I think we should give attention in mastoid cases to the conditions in the nose and epi-pharynx which cause mastoiditis, and which cause a persistence of the disease, namely, adenoids, ethmoiditis and sphenoiditis, possibly disease of the tonsils, rather than to try this very beautiful operation of Dr. Beck's of closing the pharyngeal end of the Eustachian tube.

As to the meato-mastoid, or Heath operation, or modified radical, whichever you want to call it, Dr. Beck says he has had poor results, and I believe it is because he has not selected his cases. I have operated upon twenty-five cases. Three disappeared from my observation, and in the twenty-two remaining cases I have had magnificent results, both as to cure and as to improvement in hearing, except one case of epidural abscess, which was converted into a radical mastoid. So I have twenty-one cases left with excellent results, and in which I have preserved and greatly improved the hearing. Now, whether I have an intuitive knowledge to select my cases, I do not know. But, I always carefully select my cases. I don't recommend the meato-mastoid operation for every chronic case that comes along. Three years ago a young man was in my office who had had a discharge for thirty years and that man today hears as well as I do. He has perfectly intact drumheads; they are not normal in appearance, but they are intact, and his hearing is good. I don't follow

Heath in anything but his principles, and so I call my operation the meato-mastoid operation. In the after treatment I blow air through the middle. I have been told by those who have seen my operation that I do a more extensive operation than Heath.

As to bismuth paste, it may be a good thing. I have tried it in the nose in hundreds of cases. I want to narrate just one case, in which I injected paste into the sphenoid cavity, and the patient after one year is still expelling large chunks of bismuth paste from her nose. I would be afraid to put it in the middle ear. In mastoid dressings I have used it with excellent results.

DR. W. SOHIER BRYANT, New York:—I think that Doctor Beck has given a very clear description of his excellent technique, and I will consider only a few points. In the matter of bandaging as a pre-operative dressing for the hair, I have never used the dextrin bandage, but it seems to me that in cases where it is necessary to enlarge the wound, it would be much more difficult to handle the dextrin bandage than the ordinary towel, which, if put on carefully, gives very satisfactory results. In the matter of pre-operative preparation of the skin, Doctor Beck's method of using iodine is very convenient, and I think is probably as satisfactory as any method we have. I usually use Herrington's solution, which gives as good results as the iodine, but which has the disadvantage of not being as easily prepared. In case of mastoid abscess, I think that any local anesthesia is, on account of the feelings of the patient, always contraindicated, just as in local anesthesia for any capital operation. The consciousness of the patient during mutilating operations very greatly increases the danger of shock after operation. As to the matter of using radiograms before operation for anatomical and pathological data, I think that I would hesitate to suggest a radiogram to the patient, since the expense of the radiogram would exceed any additional benefit I would expect to get for the patient. Since other signs and indications are always easy at hand, we do not need any corroboration from the radiogram in the matter of diagnosis and the determination of time for the operation. Anatomical peculiarities of the individual are important to us only in relation to the involvement of the bone, the extent of which we are not absolutely sure even with the radiogram.

As to removing all cells, I think that Doctor Beck is right. There is no question but that is the proper way. I think that it is advantageous for the surgeon to go a little farther and remove the whole mastoid process, not leaving a shell, since a bone cavity is a little more difficult to heal than a smooth surface. In the matter of the periosteum, Doctor Beck is correct in saying that a better result is obtained if a double series of sutures is made—deep sutures for the periosteum and superficial sutures for the skin. In my experience, the sutures which give the best results are chromicized catgut sutures, deep, and a metal clamp for the skin. As to the question of bloodclot or bismuth filling, I have never used the bismuth paste, for I think that the results from the bloodclot are quite as good if not better. The question of drainage of wounds is a very important one, and one in which otologists are interested at the present time. It has been found that, as a general rule, the less drainage that is used the better the result. (This statement must be made, however, with certain limitations.) In questionably dirty wounds a small amount of drainage will usually give sufficient opening for any secretions, and for this purpose a piece of rubber tissue, or rather gutta percha, will keep the opening clear and allow sufficient leakage. Lately I think that many operators, including myself, have closed most of their mastoid wounds

without using any means of drainage whatever, and very satisfactory results have been obtained.

In the radical operation, management of the Eustachian tube is a very important point, and one on which surgeons do not agree. In considering the Eustachian tube, its functional value should not be lost sight of. The hearing is always better in an ear that has a pervious Eustachian tube. The hearing after a radical operation is defective in all cases to some extent; more defective in cases where the tube is obliterated. The question of a discharging ear after a radical operation may depend upon the tube or some portion of the cavity, which has not properly epidermatized. The discharging of the tube is to be corrected by naso-pharyngeal treatment, just as if the radical operation had not been performed upon the ear. The intention of the radical operation is, as you all know, to allow the suppurative process to cease and to preserve the function of the ear. It seems that all these cases of chronic suppuration should be treated individually and that only such portions of the middle ear structures should be removed as seem to demand it at the time of operation. In most cases, where the chain of ossicles is present, it can be retained with advantage to the patient and with no delay in the cessation of the suppuration or in the process of healing of the ear.

In a general way, two points should be considered in mastoid operations: (1) Diseased tissues should be entirely removed, and (2) all structures which can possibly be preserved in the middle ear should be retained. It is very difficult to determine before the operation the exact technique which is to be followed in the operation. I think that it is absolutely impossible to predict where your lines of infection run, and one should, therefore, always be ready to proceed without a preconceived plan as to whether the operation is to be a complete mastoid, a modified radical, or a complete radical.

DR. J. W. MURPHY, Cincinnati:—I always use the subcutaneous sutures as described by Doctor Beck, but I am rather partial to silkworm gut instead of catgut. It is not so apt to break in tying, for it sometimes requires considerable pressure, and several times I have had it break, which, of course, necessitates a complete re-suturing of the entire wound again. By using silkworm gut we have much more power and can draw the wound together better, and in forty-eight hours the silkworm can be removed. It draws out very easily, and leaves no foreign body in the wound. As for the iodine dressing, I use that almost entirely, because it is very clean, there is no powder or dust about it, and I prepare extemporaneously my own solution. I have the water and iodine there, and the nurse puts in enough iodine to make a good wine-colored solution; 5 to 10 per cent is very good for the outside dressing.

The question of anesthetics was also spoken of by the essayist, and I suppose I differ from most of the other men. In my own work I almost invariably use chloroform. I know I have been criticized for that, but the only death I ever had was from ether, and I suppose I will continue to use chloroform until I have a death from that, and then change to something else. I don't use the gases and the various appliances, as many of them look like what I heard Mayo say about them some time ago, when he was called to witness an operation in a private house. He said the first thing to arrive was a moving ambulance with an anesthetic apparatus, and it required a couple of nurses to adjust the tanks, bottles, etc. He said he got so mixed up watching the administration of the anesthetic that he lost sight of the operation and didn't get to see it at all.

As for the flap, I prefer the Ballance, from the fact that it gives you a good opening. I am never satisfied with the circular opening until I

can pass the finger from the back forward. I always do that, and that gives me an ample external opening. I noticed in the illustrations that Dr. Beck only used one Allport retractor. I always use them in pairs, so my wound is a large diamond shaped wound, and controls the hemorrhage above and below. In bandaging, I apply the simple gauze bandage, used much in the same manner as the essayist mentions, but instead of using safety pins to hold this bandage, I use adhesive plaster. Several of these can be used, in strips of one-half inch, and they will hold as long as you wish to leave them.

As to the radiographs, I am not in the habit of having them taken, much from the same cause as mentioned by Dr. Bryant, that it adds considerable expense to the patient, and I do not believe that it adds a great deal to our method of operating. We have to follow up wherever we find the disease. However, in all hospital cases I take them, because we have the apparatus there.

DR. L. W. DEAN, Iowa City:—Just a few words about a point made by Dr. Beck. He spoke about having the head of the patient on the end of the operating table or a little bit springy, in order to avoid the jar. I have been designing, or rather partially designing, an operating table for my work in the last few weeks, and I was interested in that phase of the subject. Last Friday I had an opportunity of doing two radical mastoids, in each case where it was necessary to expose a large area of the dura, and in each case I tried the same thing. I put the head of the patient on the springy headpiece of the table, and in using my chisel I noticed the jar, as evidenced by the vibrations of the dura; then I pulled the patient's head back so it rested on solid table, and I was surprised at the difference in vibration in the two places. It was decidedly less noticeable when the patient's head was on the solid portion of the table. In cutting a green stick, you must use a greater force if the stick is not solidly supported than if it is thus supported, and from my observations last Friday I believe it is far better, since the skull is green and springy, to have it on solid table.

DR. THOMPSON, Cincinnati, Ohio:—In reference to the Eustachian tube, it has undoubtedly given everybody a great deal of trouble. I have managed to overcome that in the radical operation by the use of an olive-shaped gold bead, or glass bead. It is easily inserted and gives no after trouble at all. It is inserted into the mouth of the tube at the time of the operation in through the middle ear. As a dressing for mastoids I have used, with the best results, half inch moist iodoform gauze, cut on the bias, and after closing my external wound, except a small portion at the bottom, I pack this through the enlarged external meatus, fold it in carefully, watching the gauze as you pack it through the posterior wound. After my sutures are in, I tie over that. I never put the gauze in under pressure; always loose, and leave it that way.

As to the jar, I noticed that when associated with Dr. Holmes. I procured an ordinary compressed air seat, which is readily sterilized and has a small opening in the center, and by putting the linens over that, it can be easily tucked under the patient's head, changing the towels frequently, and that does away with all jars and makes it much easier for the assistant to hold the head in position.

DR. A. H. ANDREWS, Chicago:—I heartily approve of Dr. Dean's remarks in regard to concussion in mastoid operations. They are directly in line with my own observations. I also think if we will use sharp, thin chisels instead of blunt chisels we will not be troubled with the jar. I think the Committee on Nomenclature should take up the matter of names for these various operations. Dr. Beck mentions the simple radical and

the semi-radical. I think it best to speak of mastoid operation, when the mastoid alone is involved, or of the meato-mastoid, or of the tympano-mastoid.

I also understood Dr. Beck to say that he advocates curetting of the antrum in the acute cases. If so, I want to protest against the procedure. The antrum is a part of the middle ear cavity proper and is not a part of the mastoid, and should for the sake of the hearing be let alone in the simple mastoid operation unless there is evidence of necrosis.

I think the results in the meato-mastoid operation in suitable cases are excellent. I reported three cases to the Chicago Medical Society that I had operated on practically by that method some considerable time before Heath made his report. Regarding the operations under local anesthetics, I would say that when I am going to operate under a local anesthetic, because of the psychic effect, I do not select that method for any of my friends or anybody I am going to live close to afterwards. It is bad enough to take a patient into an operating room and give the anesthetic with the instruments and apparatus in sight, to say nothing about operating upon him when he is conscious.

As a rule it has been my observation that the less I pack my cases, the quicker they get well. One point regarding putting on the bandage. It took me years to find out that if I put the bandage on from before backwards my wound would get along better than if I put it on from behind forward. Each turn puts the sutures on the stretch and they suppurate and pull out.

I have used bismuth paste in my mastoid operations to apparent advantage, but I remember saying in the Chicago Medical Society that I was afraid to inject the paste into a suppurating middle ear.

DR. KATE BALDWIN, Philadelphia:—Just one word in connection with the question of drainage. I find that a thin china silk is better than any other material. Used as a wick, or packing, or folded as a drain, it does not stick to the wound, and is easily removed.

DR. J. F. BARNHILL, Indianapolis:—Dr. Sprague has described my own method of preparation of the patient by swathing the head in a piece of sterile gauze. By this method there is no possibility of the hair or septic matter of any kind getting into the wound. This, I think, is the method of Cushing, and one which is, in my opinion, preferable to that described by Dr. Beck.

There are a number of points in the paper that I have noted for discussion that have been fully covered by those who have preceded me. I shall therefore confine myself to one or two points. In regard to the Eustachian tube, I want to put myself on record as being in complete accord with what Dr. Ballenger has said as to the possible cause of continued suppuration in the ear when the tube seems to be at fault. The doctor partially explained that the disease, for which the operation was performed, came about in all probability because originally there was a bad throat, and that in 95 per cent of the cases the throat trouble consisted in the presence of an adenoid. We all know that we have removed, even in patients 25 and 30 years of age, an adenoid of considerable size; and though not so large the adenoid may be the cause of chronic nasopharyngeal inflammation; or the naso-pharyngeal condition mentioned by Dr. Bryant—a condition which would require treatment under any circumstances—is present. It seems to me unfortunate to drill into or thoroughly curette an innocent Eustachian tube when better results might follow from treatment of the naso-pharynx. I think we should in many cases of the radical mastoid operation divide the time which is ordinarily given to

treatment of the Eustachian tube with an equal amount of time that should be given then, previously or subsequently, to treatment of the diseased condition of the naso-pharynx.

After trying most of the methods of preparing the skin flaps, I have come to use almost exclusively the Panse flap. I believe that it leaves a somewhat deformed ear when it is made in its fulness, and large enough, yet a large opening is needed for the necessary after-treatment of the wound. I don't believe that we as operators ever do our duty to the patient, or put the wound in the best possible condition for certain cure, unless we leave a window into the operated cavity which is large enough to inspect and intelligently treat any riotous granulations which may form during the healing period.

DR. OLIVER TYDINGS, Chicago:—There is one thing I wish to speak of, and that is anesthesia. My observation has been that after a patient is once under the influence of an anesthetic, we can almost wholly discontinue it while doing bone work. It makes quite a difference in the condition of your patient afterwards. I use ether by preference. I had one death while using chloroform. I had used chloroform for twenty-five years before this, and then this patient hadn't taken a half drachm before he was dead. The man administering it knew what he was doing; it was a coincidence and chloroform had nothing to do with it.

A point I want to make also is in reference to dressing of radical cases. In these cases for a number of years I have used vaseline with bismuth, because I had found in doing nose work that I got absolutely no odor, and it made the removal of these dressings very easy. I had impressed upon my mind the necessity of doing nose and throat work in connection with mastoid cases by a case operated on twice for mastoid, first a simple, then a radical. There was intense pain in the ear. Looking into it I found a polypus protruding from the external meatus, and I removed it. Still, when I found there wasn't anything behind this, that it had not anything to do with the pain, I looked into the throat and found enlarged and inflamed tonsils. I removed these, and afterwards removed some adenoid tissue. There have been no operations for mastoid since and his pain has disappeared.

DR. JOS. BECK, Chicago (closing):—In the first place I must touch on the starch bandage. That cuts with the finest scissors. That isn't a hard substance. As to the anesthetic, I only use a local anesthetic or oxygen and gas when I can't use any other. Supposing you have a case, as I have cited here, a child, post-scarlatinal, has a sinus thrombosis, has a nephritis, a capillary bronchitis; you give it gas and oxygen and you will be very well satisfied with the result. As to the radiograms, of course, I do not drag them into a house, because I don't operate mastoids in a house; we have hospitals for that, and all first-class hospitals have radiographers. I don't know why Dr. Bryant has not used them, but I will say that if he has read as many radiograms as I have, he will find a great deal of pleasure and satisfaction in them, and would use them in all cases possible. It is a distinct advance in science, and I am sorry that the Doctor has decried a method of diagnosis that we must look forward to. As to decapitation of the mastoid, I believe it is unnecessary to take off half the head, as these radiograms show it would be necessary.

Now as to the jar. This table does not jar a particle; it has just sufficient elasticity. Now another point discussed and misunderstood, as to the cause of Eustachian trouble. Certainly we don't attempt closure of the pharyngeal end at the time of operation. I simply mention it as an experimental thing after you have done all your cleaning and the tube still remains open. How many of you will acknowledge that you have

discharge after operating? I am sure that it happens very often in my experience. Of course, I remove tonsils and adenoids when necessary, as well as any naso-pharyngeal condition that may influence this perpetual tubal leakage. I am going to add Dr. Sprague's remarks to my paper, as he is the originator of this method. I want to thank him because it is an excellent method of primary union of the mastoid wound.

LARYNGEAL NEOPLASMS—A LATER REVIEW.

By J. LESLIE DAVIS, M.D.

PHILADELPHIA.

In coming before the Academy for the third successive year with a review of "Laryngeal Neoplasms" it might not be amiss to impart something by way of personal testimony regarding the sensations with which I approached the subject then and now, the "before and after taking."

In the first place it was selected not as a field in which I was either skilled in personal experience or conversant with the work of others; I had no message to deliver; I simply claimed fellowship with the brotherhood "seekers after truth." So the most that I could claim for myself was that I was in position to approach the subject without prejudice.

I have had an opportunity to observe a few cases in which the unfortunate victims of laryngeal malignant invasion gradually succumbed to suffocation, starvation or operation; some of these had come to me for relief and had gone away without it, though leaving with me, fortunately, a spirit of discontent in proportion to the discouragement which my helplessness had imparted to them.

I have seen a few less hopelessly afflicted, yet greatly handicapped by loss of voice from benign obstructions, the relief of whom lent encouragement toward further effort.

Three years observation, then, has served to extend the horizon of my vision so that I now realize, at least better than before, how much there is yet to learn. I *have* learned a few facts with which everyone holding a physician's certificate ought to be familiar, and I beg your indulgence to enumerate:

(1) That every case of hoarseness persisting beyond the usual course of an acute cold calls for careful laryngeal inspection.

(2) That chronic hoarseness in an individual past the age of forty which does not yield to treatment should be regarded as a probable precursor of a malignant growth even before the possibility of visual verification.

(3) That the "pre-cancer period" is the only period in which the patient can be given any degree of assurance of a possible cure and only through adequate operation.

(4) That a growth in the larynx of any one past middle life should be regarded as possibly malignant till it is found to be innocent.

(5) That every innocent neoplasm should be eradicated not only because of its own interference with normal function, but lest through prolonged irritation there be set up in that vicinity a proliferation of latent cancer cells.

The result of my first two years' investigation and observation of the work of others was set forth in the previous papers alluded to: the inadequacy of and the discrepancies in the older literature has become a hackneyed phrase in recent writings and yet I doubt not but that the errors therein recorded will appear mild in comparison with those that another generation may find in the majority of our records of today. Since the day when men drew swords in defense of old beliefs the pendulum of tolerance has swung to the opposite extreme.

In this age of scientific "scorching" we have grown so accustomed to daily revisions of yesterday's beliefs that we dare not prophesy for tomorrow.

There is a peril in this constant expectant attitude in the tendency to frame conclusions from faulty premises.

Dr. McConkey is "convinced that the tubercle bacillus is the fundamental cause of malignant growths," and he may be right; but when he states that he is not aware of the theory having ever been advanced, and that his conclusion has been reached after "months of investigation," some of us at least will be inclined to suspend judgment on the ground of insufficient evidence.

The trypsin treatment of cancer was heralded throughout the world by both the scientific and secular press, and undoubtedly has in it an element of value in its proper field of application, notwithstanding those who condemn it unconditionally on the testimony of a few failures, and others who support it with equal enthusiasm as almost a specific with probably no more evidence than a few cases that thrived temporarily.

Dr. Massey of Philadelphia, who has reported gratifying results in the treatment of carcinoma for some years by means of cataphoric sterilization, has given me reports of two cases of laryngeal carcinoma, the only laryngeal cases he has treated, and while the result in neither case was very gratifying, yet profiting by the errors which he now can see, he suggests the method that he would adopt in the treatment of other cases. At least a commendable spirit.

Writers in recent literature have harped on the importance of early diagnosis, and "*adequate operation beyond the microscopic edge*" of the malignant growth,—a principle of sufficient importance to deserve italicised emphasis in every article published, and

every means of aiding in such diagnoses should supplant the statement. Toward this end the new pharyngoscope, as devised by Dr. Harold Hayes, of New York, is deserving of the attention of every one who may have occasion to examine the larynx.

And, likewise credit is due to Dr. Jackson for the separable speculum which has facilitated the process of diagnosis in the cases of malignant neoplasms and rendered more accessible the removal of those which are found to be benign.

We hail with delight the announcement of a blood test that may make possible an unerring diagnosis of incipient cancer and when a favorable report comes from one so scientifically reliable and of so wide experience as Crile, its value is all but convincing to the most incredulous. Reports, however, from other sources possibly equally as reliable on the Hemolytic properties of cancer serum show wide variance, though none obtaining as high and as constant percentage of positive results as did Dr. Crile.

Undoubtedly we are living in the transitional period between the old and a new conception of the cancer scourge; there has developed a more hopeful anxiety among both professional and laymen, yet both alike are restless for results.

Statistics indicate an increase in cancer; whether this is actual, beyond the proportionate increase in population, or whether it is due to its being more universally detected and reported, can not just now be well determined.

In the meantime there needs to be developed a spirit of personal responsibility on the part of every physician to give every effort toward its conquest, and Dr. Crile in a recently published article on cancer, in addition to a reiteration of well recognized observation, places upon the laryngologist this well deserved burden of responsibility: "There is one cancer region, in my opinion, that has fared undeservedly badly, viz.: cancer of the larynx, especially the intrinsic form. Sometimes a papilloma, sometimes an ulcer precedes it. Every voice sound gives the warning, not only gives it but gives it in its very beginning. This anatomical region is not specially well supplied with lymphatics; lymphatic metastases come late. The hyaline cartilage composing the box of the larynx cannot be invaded by cancer. I have seen a cancer fill the entire larynx, pass out through the thyrohyoidian membrane, spread out upon the external surface of the box, literally making of it a sandwich and yet a painstaking microscopic examination failed to discover even the slightest invasion of the cartilage. Here we have in a 'safety deposit box' a cancer announcing itself by every spoken word and yet relief measures are delayed or with-

held. The Laryngologist holds the key. It may be a benign tumor, it may be syphilis. Very well, the patient is given the benefit (?) of the doubt. It is treated and watched. At first local treatments are tested, then a course of specific treatment. Meanwhile the physiologic adaptation of the observer to the steady growth of the tumor makes it impossible to accurately estimate the advance and so the cancer and the observer drift along together, the difference being that the cancer has a fixed policy. Like the constant observation of the growth of a tree or a child, no change is noted daily, but at intervals a chance comparison reveals the progress, so the observer of a laryngeal cancer is suddenly startled by its large size. Reflecting on the old statistics of laryngectomy, pessimism halts its decision. The case ends in a late radical operation or a palliative tracheotomy. Intrinsic cancer of the larynx, owing to the three circumstances, its early warning voice symptom, its scanty lymphatic drainage, and its position should render it one of the most curable cancers in the human body. This will never be accomplished by watching it grow out of its early and operable stages. The operative risk of partial or complete laryngectomy or laryngotomy, is at present so low that the former hesitation in advising surgical treatment no longer holds."

We see with equal frequency the laryngologist's lamentation that the great majority of laryngeal carcinomata have advanced beyond the point of control before he is called in consultation, consequently there is always left the gravest prognosis. If we are still to admit the inadequacy of all means to eradicate the ravages of the cancerous cell, except in that stage of incipiency in which detection is rarely possible, then let us in our eager search for a pathognomonic principle in diagnosis not lose sight of any source to procure for the patient the greatest possible comfort during the siege that is to follow. The word "palliative" seems lost to most of us without its modifying adverb "only:" thus I believe we regard too lightly the consideration of palliative measures.

How prone we are to shrink from the care of one afflicted beyond the chance of cure!

So thoroughly has the subject of clinical diagnosis and operative procedures in laryngeal carcinoma been covered recently by Dr. Chevalier Jackson and published in the August number of the *Laryngoscope*, that I refrain from attempting comment other than in a word of commendation. I deem the evidence gained from the classified records of 141 cases under the care of one so thor-

oughly qualified to cope with every phase of the situation, to be of greater value by far than any collation of ten times the number of cases reported by a hundred different authors with but limited experience.

Leaving that part of the subject then to Dr. Jackson's report which is up to date with a completeness unapproachable, permit me in its stead a paragraph on the means within our reach for the purpose of palliation.

Granted that the case when first seen is inoperable according to the contraindications quoted from the above mentioned article of Jackson, what can be done toward the comfort of the patient?

Whether or not such patients should be advised of their real condition is a matter involving the personal equation on the part of both physician and patient. As a rule discouragement feeds on vitality, thus shortening the limit of the patient's existence;—following which statement the most natural remark would be, "thereby being a blessing."

But who would dare shoulder the responsibility of appraising the value of even a few hours that may be added to one's life!

The distressing symptoms of pain and odor that are commonly associated with cancer in other regions are not always present in the larynx, where the sensation of suffocation is possibly the patient's greatest terror.

I would place first, then, in importance the establishment of the least labored respiration, whether it be accomplished simply by tracheotomy or by laryngectomy—partial or complete.

Owing to its marked devitalization of abnormal cell growth and stimulating effect upon healthy tissue, Xray exposure has come to be regarded of value when used in conjunction with and following operative measures.

Dr. Pfahler of Philadelphia, whose experience is wide in its application, believes the Xray of palliative value even before surgical interference, on account of the superficial location of the larynx, and particularly after operation.

The frequency with which such treatment is improperly used and promptly condemned, however, emphasizes the importance of its being employed only in the hands of an expert.

Delavan of New York, and Scheppegegrell of New Orleans—two most careful observers—made conservative reports several years ago on the Xray, but have not shown any greater enthusiasm in later reports. Where pain and odor are present it is generally recognized as one of the best measures at our disposal.

The serum treatment, still commended and condemned, can most assuredly be given a chance without harm.

Gradual starvation must be met by the employment of the most scientific feeding throughout the course of the disease, and toxemia combatted through the establishment of thorough elimination.

Morphia, of course, is the last appeal and must be administered at any period and in any quantity according to the urgency of the case. The least possible suffering of the patient with the greatest prolongation of life seems to be the safest guide for the conscientious, competent physician.

BENIGN NEOPLASMS.

The consideration of benign laryngeal growths seems a trivial matter when compared with that of the malignant,—so far as their seriousness to life is concerned—yet there are few discrepancies in opinion regarding the necessity for or the method of their removal.

Till the introduction of the separable speculum benign neoplasms were removed with forceps by indirect illumination or by the more radical means of thyrotomy. Attempts at cauterization are now rarely made, and never justifiable.

In the case of multiple papillomata in children there has been a predominant note in favor of noninterference with the growth with an attempt at absolute rest of the larynx by means of tracheotomy. Personally I do not favor that procedure. In my limited experience I have had but six cases of multiple papillomata—one of which (reported last year) I operated on by thyrotomy, two with the separable speculum and three by indirect illumination with the Pfau laryngeal punch. Two of the last cases partially recurred and had to be removed the second time.

The case of the child operated on by thyrotomy and reported in last year's paper has been most gratifying in the eventual result, having had a statement from her physician a few days ago that during the past year her voice has been clear with the exception of slight hoarseness when suffering from an occasional cold.

At the time this case was operated on I had not adopted the use of the separable speculum, though if I had a similar case at the present time I do not believe that it could be adequately handled by other means than thyrotomy, since the growth extended for a distance of one-half inch below the vocal cords and almost occluded the cavity. At present my choice of method for the removal of any benign growth depends upon the location of the

neoplasm. For a small tumor originating along the margin of the vocal cords I use the Pfau laryngeal punch by indirect illumination under cocain anesthesia; for more extensive involvements such as tumors with sessile attachment, those in the anterior commissure, or springing from the ventricles, I use the direct method by means of the separable speculum, under general anesthesia; for more extensive invasions of the larynx, where the growth extends well below the vocal cords and producing marked interference with respiration, I would prefer thyrotomy. Immediately following the removal of every benign growth I have made it a rule to apply a ten per cent solution of nitrate of silver carefully to the raw surface; this controls the immediate hemorrhage, and should there be an excess of granulation in the course of healing, the application may be repeated. For at least a week following operation on any form of tumor I insist upon the most complete rest for the larynx that is possible to be obtained.

The message, then, that I now have for you and for others who have so earnestly and efficiently blazed the trail along so rough a road, is simply one of gratitude for the guide posts you have left along the way, and for the encouragement that your faithful efforts have justified.

AMPUTATION OF THE EPIGLOTTIS IN LARYNGEAL TUBERCULOSIS.

LORENZO B. LOCKARD, M.D.
DENVER, COLO.

By far the most fatal, as well as the most painful localization of tuberculosis in the larynx, is the epiglottidean; a type always resistant to treatment, rapid in development and extension, and deplorable in the subjective symptoms evoked.

The picture presented by the unfortunate subject of such a process is well known to all, and no other condition, with the possible exception of a malignant growth, induces a feeling of such utter helplessness as to either cure or effective palliation.

That it is possible, however, through radical extirpation of the involved organ, to effectively relieve the pain in practically all of these cases, and to permanently cure the larynx in a small proportion, has, I believe, been conclusively demonstrated.

Extensive studies upon the living and the dead have shown that approximately one-third of all consumptives have, in greater or lesser degree, coincident involvement of the throat, and statistics prove that in over 20 per cent of the laryngeal cases the epiglottis is involved. That this estimate is conservative is shown by the following table:

Author.	Cases of Laryngeal	
	Tuberculosis.	Lesions of Epiglottis.
Mackenzie	500	175
Mackenzie	100 (Post mortems)	81
Lake	329	68
Carmody	155	58
Stein.	100	65 (Est.)
T. J. Harris.....	125	35 (Est.)
Author	961	136
	<hr/> 2,270	<hr/> 618—27.22%

In the above table the number of cases of epiglottidean involvement has been compared with the total number having laryngeal tuberculosis. In the following table the number of epiglottidean cases is compared with the total of laryngeal lesions, a method that gives a much smaller percentage, as each individual usually has several distinct foci.

Author.	Lesions of Larynx.	Lesions of Epiglottis.
Gaul	140	27
Mackenzie	1,174	186
Lake	859	82
Phipps Institute	150	14
Author	1,671	127
	<hr/> 3,994	<hr/> 436—10.91%

These statistics show that this form of the disease, instead of being a rare manifestation, as is commonly believed, is a relatively frequent complication.

A tuberculous lesion of the epiglottis, while occasionally the sole localization of the disease in the throat, occurs, as a rule, in patients with older and well developed foci of other segments of the larynx, notably of the arytenoid cartilages and aryteno-epiglottidean folds. Isolated epiglottidean disease, in individuals having pulmonary tuberculosis, has been observed in only a few instances, of which the following may be cited:

Author.	Laryngeal Disease limited to Epiglottis.
Stein	2
Barwell	1
T. J. Harris	1
H. Bert Ellis	5
Lake	4
Carmody	1
Besold & Gidionsen	8
Author	4
	<hr/> 26

On theoretical grounds the possibility of an epiglottidean focus being the first and only lesion in the body must be admitted, but from a practical standpoint the question scarcely deserves serious consideration. B. L. Shurly, in a personal communication, reports one case of apparently primary infection, and one to which considerable doubt attaches is recorded by Lake, the only ones found in a close review of 4,991 cases.

As already shown, epiglottidean tuberculosis is practically always associated with advanced disease of other segments of the larynx and of the lungs, and to this fact, in large measure, can be accredited its appalling mortality, for even if the epiglottidean disease were capable of arrest or cure, the patient would usually succumb to these concurrent processes. Even when the pulmonary and other laryngeal foci are incipient or quiescent, their advancement is rapid after breaking down of the epiglottis, for the se-

vere dysphagia and resultant cachexia soon destroy what little vitality the tissues have retained, and these conditions have generally supervened by the time the case comes under observation.

Even in the incipient cases little is to be anticipated from medicinal treatment, for as a rule they progress rapidly from bad to worse, while in those with advanced lesions we are even powerless to control the terrible dysphagia.

From such statistics as are available it would seem that the general mortality of these cases, including both the incipient and advanced, is in the neighborhood of 90 per cent. If one took into account the advanced cases only, those associated with severe dysphagia, it would be found that not more than one to two per cent result in local healing. Many eminent laryngologists place the death rate in this class of patients at 100 per cent.

These statistics, moreover, do not show the full extent of our helplessness, for in addition to the failure to cure or even temporarily arrest the process, we achieve but little in the way of relief; success in conquering or markedly lessening the dysphagia would palliate, in large degree, our lack of success in overcoming the disease.

Any method of treatment, therefore, that offers some hope of local cure in favorable cases, and a promise of euthanasia in the incurable, deserves serious consideration, and such a method we unquestionably possess in complete amputation.

Although the number of enduring cures of the patient, as a result of the operation, is small, and must ever remain so, because of associated conditions in other organs, the procedure does undoubtedly save an occasional case, and I feel that the statement is justifiable that no palliative operation, in the whole domain of surgery, gives more brilliant immediate results.

That eventual cures are not more frequently attained is no valid objection to its performance, for the vast majority are already irrevocably doomed when they come under the laryngologist's observation, and we are confronted by a single problem, the relief of pain. In a not inconsiderable proportion of these cases, however, a complete arrest of the laryngeal process is attained, and in a small number the removal of this complication enables the body to conquer the basic disease.

Of the twenty-seven cases operated by the author, twenty-six were relieved of pain; in eight the larynx was cured, and in five the pulmonary process eventually became quiescent. Three cases are still under treatment. In one case the palate was also

involved, but even in this instance deglutition was greatly facilitated.

Of the cured cases one has endured five years and a half and one four years and eight months.

When it is recognized that these cases, if operated early, before the vitality is hopelessly impaired and the accompanying conditions advanced to an incurable stage, are susceptible of cure, the operation will take its place as a curative as well as a palliative procedure.

The average length of life after operation, the usual way of estimating the utility of such a procedure, is of absolutely no importance in this connection, for it is in no way an index of its effectiveness; the amputation, nine times out of ten, is made with the sole idea of relieving pain, with the knowledge that life cannot be prolonged more than a few months at most, hence statistics are certain to be misleading and disappointing.

Thus Lake, in summarizing his results according to this method, says, "By these methods I have removed the epiglottis some fifteen times. Speaking from this experience, I consider the average duration of life, after operation in bad cases, to be not less than three months and seldom more than nine months, and in a certain number in which the epiglottis is attacked earlier than usual in the course of the laryngeal and pulmonary disease, a complete cure may result."

Since the results are very favorable when the operation is performed before the concurrent processes are very far advanced, a triple classification in tabulating the cases will be attempted.

(a) Results in patients who, were it not for the epiglottidean involvement, might be classed as favorable.

(b) Results in patients suffering from dysphagia due to involvement of the epiglottis, in whom the pulmonary or other laryngeal lesions would warrant an unfavorable prognosis, even if the epiglottis were not affected.

(c) Because of the impossibility of getting definite data regarding the general condition of a large number of cases operated, a separate table, including these cases, must be made.

In cases of the first class a large percentage of enduring cures may be anticipated. In the second class, comprising the great majority, an occasional cure only may be attained, but these would undoubtedly succumb under other methods of treatment, and in those that do not recover the dysphagia will usually completely disappear.

	Number of Cases, 240
Heryng	100
Barwell	30
Lake	15
Freudenthal	10
Harris	2
Carmody	9
Schmidt	9
Hajek	1
Moeller	20
Beck	1
Gleitsman	3
Flatau	1
Sollenberger	2
Gruenwald	1
Gerber	3*
Sokolowski	3*
Potter	1 (cancer)
Bennett	1
Newman	1
Author	27
	<hr/> 240

The operation has also been done a number of times by Bezold and Gidionsen.

ANALYSIS OF 134 CASES.

CLASS "A."

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
11	11	11	8	5
			3 under treatment.	3 no report. 3 under treatment.

CLASS "B."

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
83	79	70	3	0

CLASS "C."

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
40	25	25	8	7

TOTALS.

134	115	106	19	12
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	CLASS A.	CLASS B.	CLASS C.
Pain relieved	100%	95.18%	62.5%
Epiglottis healed	100%	84.33%	62%
Larynx healed	72.72%	3.61%	20%
Patient cured	45.45%	0.00%	17.5%

TOTALS.

Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
85.82%	79.1%	14.17%	8.95%

*Some additional cases. Number not specified.

An additional one hundred cases, reported by Heryng in a personal communication, are not included in this report, since general conclusions only were given. He says: "I have operated about one hundred times, seventy times with the double curette, and perhaps twenty-five times with the galvano-cautery snare. The cautery seemed, in a number of instances, to provoke severe and prolonged reaction. When possible I remove either the entire epiglottis, or one-half, with the double curette or cold snare, because after their use there is only the slightest reaction, and the dysphagia disappears more promptly. Evil consequences, such as severe bleeding, I have never experienced."

There are six other cases not included in the report. Of these five could not be analyzed; the sixth was a case of cancer involving the epiglottis in which amputation gave wonderful relief.

In considering these figures allowance must be made for two sources of error. In the first place, in a small number of cases, after varying periods of complete relief, some pain recurred owing to progression of complicating laryngeal lesions, and, on the other hand, some cases benefited to a considerable degree were not classed as successful, for I have attempted to tabulate as relieved only those in whom no dysphagia persisted.

Many cases pass from observation after relief of the subjective symptoms, hence the statistics regarding the eventual outcome of the disease in the lungs and larynx are very incomplete.

Of all the authorities consulted, who have performed the operation, only one believes it to be unwarranted—Sokolowski of Warsaw.

He writes: "Gradually, from year to year, I have departed from the surgical treatment of laryngeal tuberculosis, because by general treatment, combined with local treatment (carbolic acid, menthol, lactic acid, etc.), I achieve improvement and healing without the bad results of the surgical procedures. For the same reasons we have given up complete and partial amputations of the epiglottis, which I previously performed in some cases without any striking results. Recently my long time assistant, Dr. Erbrich, operated, in our hospital, three cases of advanced laryngeal tuberculosis with severe dysphagia, after ineffectual local treatment, by excision of the epiglottis, but the results were not satisfactory, as the dysphagia was not relieved.

A considerable number opposed the procedure on theoretical grounds, and yet a larger number, who had not done the complete operation, favored, in certain cases of limited involvement

the excision of small areas. As this paper deals only with the complete operation, their valuable work cannot be quoted.

The general opinion of those who have had considerable experience with the operation is well reflected by Jorgen Moeller of Copenhagen, who wrote to me as follows: "As you see I have this time (ten unreported cases) no brilliant results to report. The cases, however, were all very bad, and in which the indications for the operation, as previously adhered to, were extended to embrace all cases of severe dysphagia due to the epiglottis, even when the lungs were hopelessly diseased. (In his previous ten cases, in which the line was more strictly drawn, he had three cures; two of these are still well, and one has had a recurrence.) It appears to me, however, that the history of these cases supports the correctness of this extension of the indications for amputation, because almost without exception there was wonderful relief that lasted for a longer or shorter time, frequently until death."

INDICATIONS.

There need be no confusion regarding the types of cases in which amputation is indicated.

(1) The operation is imperatively demanded in every case of involvement accompanied by severe dysphagia, regardless of the state of the lungs.

(2) Immediate removal is indicated even when dysphagia has not supervened, provided the lesion is extensive and there is still hope of arresting the pulmonic disease. The existence of such a focus is a constant menace, because it may at any moment give rise to severe pain and in a brief period cause irreparable injury.

(3) Any lesion that resists treatment should be excised.

(4) If the condition of the epiglottis is such as to hinder correct treatment of underlying lesions, it may be removed to render these parts more accessible.

METHODS OF AMPUTATION.

The methods employed are unimportant provided they permit of complete excision and leave a smooth stump. If the lesions are sharply circumscribed only the affected parts need be removed, but when there is considerable involvement, or if doubt exists as to the true limits of the disease, the entire organ should be amputated.

The preferences of the individual may decide in favor of the cutting forceps, the cold snare, or the electric snare.

In my earlier cases I used the galvano-cautery snare, but early

abandoned it owing to the severe reaction experienced in nearly every instance. In one of my last cases I used the cold wire as advocated by Gerber of Koenigsberg, who has operated three times in this way. In its favor he claims (1) slight reaction in the neighboring tissues, (2) slight pain and little bleeding, (3) rapid performance.

In my case the first two indications were fulfilled, but owing to a slight slipping of the loop it was necessary to remove the central base with the forceps.

Gerber says: "I have frequently removed the epiglottis, formerly with the cutting forceps and cautery. Of late, however, with especially good results by means of the cold snare. I have undertaken this for the relief of severe dysphagia and have had very good results."

An influence upon the general disease in cases of extensive tuberculosis has not been experienced or expected.

With perfect adaptation of the snare much time may be saved, as it is rarely possible, with the cutting instruments, to thoroughly remove the organ with less than three distinct sections; one for the central portion and one each for the lateral thirds.

Of the cutting forceps there are two of almost equal utility, the Lake-Barwell and the Spiess. The great fault with the Spiess instrument, as commonly made, is that it has the same length of shaft and curve as the instruments designed for endolaryngeal work, so that, in many instances, when the cutting blades are in position, the shaft impinges against the palate to such an extent that free manipulation is impossible. In one instance, when no other instrument was available, nearly three hours were consumed in the operation, as the irritation produced in the attempts to introduce the instrument caused uncontrollable gagging. With the correction of this defect it would be a very valuable instrument. In the Lake-Barwell forceps this defect does not exist. The operation is likewise simplified by the possession of several instruments of various sizes, with the blades placed at different angles to the shaft, for in no two instances is the epiglottis of the same size and shape.

In several instances I have successfully used a modified lingual tonsillotome.

The parts can be so completely anesthetized with 20 per cent cocain as to make the operation practically painless. Never have I seen even the most sensitive and nervous patient rebel.

Hemorrhage is seldom severe and it is not necessary to make preliminary application of adrenalin. After each section there is

free bleeding for a few seconds, necessitating a brief period of waiting before the following cut can be made. In only one case of which I have record has the bleeding ever been profuse. This occurred in the practice of Harold Barwell, but no especial procedures were necessary for its control.

The report of an interesting case of hemorrhage was sent me by Moeller of Copenhagen. He writes: "Immediately (after the amputation) severe bleeding occurred, which, despite the local use of ice, persisted unabated for an hour, when I was able to get a good view of the larynx and found the wound covered with a firm coagulum and no bleeding point. The patient also declared that his sensations were the same as during a previous pulmonary hemorrhage. He was therefore sent to the hospital. After six weeks he was discharged feeling very good. There was however, no demonstrable improvement in the pulmonary process. The amputation wound was almost completely cicatrized. The disease in the interior of the larynx needs further treatment."

In nearly all of my cases the organ was removed as nearly as possible to the base, but never was there any bleeding of moment. The last vestige of blood in the septum has usually disappeared within a quarter of an hour.

In its exposed condition, subject to constant insult by the pulmonary secretions, it would seem probable that post-operative infection would be a danger of considerable magnitude, but this contingency has only rarely materialized. Lake reports one case of infection of the stump that responded to treatment, and I have seen two cases in which superficial ulceration occurred. In both instances the ulcer disappeared under the use of antiseptic sprays and cauterizing pigments. In one case the stump became infiltrated but did not produce any particular discomfort. In several additional cases, in which the dysphagia was completely relieved, the stump was not entirely healed at the time of death, but including three it leaves, in my series, twenty-three cases of perfect healing in a total of twenty-seven.

Barwell, in thirty amputations, has not met with one where there was post-operative ulceration or inflammation. Gleitsman has removed the organ three times without subsequent local infection. T. J. Harris did not have it in either of his two cases, and Carmody, in nine cases which he operated, had two in which the wound was not completely cicatrized at the time of death. In the remaining seven local healing was perfect.

Aggravation of the pulmonary process must be an accident of extreme rarity. Barwell, in a personal communication, says:

"In nearly all of my cases the excision has been performed merely for the relief of dysphagia, for in my experience infiltration of the epiglottis seldom occurs until the disease in the lungs and other parts of the larynx is so far advanced that cure is out of the question. I have never seen any shock; hemorrhage has never been dangerous, and only profuse in one case. I have never found the general condition made worse by the operation. The wound never becomes inflamed nor acts as the starting point of ulceration; in most cases where the general condition is fairly good it tends to heal rapidly and often becomes completely healed in about fourteen days. In every case the severe dysphagia has been much improved and frequently quite abolished, but in some removal of the arytenoid swelling has been necessary as well."

Dr. Freudenthal, in summarizing the results of his ten operations, says: "A reinfection was stirred up that caused death in some cases within a week."

In one of my cases, a man of twenty-three years, there occurred, ten days after operation, a miliary outbreak in the pharynx and naso-pharynx, that soon produced wide destruction of tissue. The patient had large cavities in both lungs, universal laryngeal involvement, and a large tuberculous ulcer on the right cheek, above and posterior to the last molar, forming a necrotic pouch as large as a hickory nut. At the time of operation this ulcer was extending to the anterior pillar and the temperature was ranging around 103 degrees. Two weeks before the epiglottis was removed he was operated for appendicitis. The miliary outbreak could hardly be accredited to the operation, which was performed because deglutition had become impossible and he was starving to death. The pain was greatly lessened by the operation and thereafter could be largely controlled by cocain and morphin.

In very exceptional cases the cough is temporarily aggravated and the septum increased, but these symptoms rapidly subside. In the great majority of instances the exact opposite obtains and the cough is almost at once diminished in frequency and severity, sometimes to an extent that seems almost incredible. Occasionally the temperature is slightly elevated for one or two days, but usually there is a decided and almost immediate fall from the average maintained during the preceding weeks, the decline in several cases amounting to three and four degrees within the first few days.

AFTER TREATMENT.

Because of the theoretical considerations it was long the author's practice to have the patient fed by nutrient enemata during the first week. Today he permits the taking of non-irritant liquid food within a few hours of the time of operation. As a rule little pain is experienced, but as paroxysms of coughing are occasionally, though rarely, provoked, it is advisable that solid food be withheld for a couple of days. In a number of instances a full meal has been eaten at the end of forty-eight hours. If difficulty in swallowing is experienced within the first days, the food should be taken through a tube, while the patient lies prone with the head well below the level of the body. In the short intervals during which solid foods are withheld the strength is maintained by raw eggs in milk, custards, beef juice, Biftick a la Tartare, raw oysters, gelatines, etc.

During the first twenty-four or thirty-six hours comfort is promoted by keeping the air of the room impregnated with steam, and there is nothing more soothing than the following mixture, one teaspoonful to the pint of boiling water:

Ol. pinus pumilionus.....	Dram 1.
Menthol	Gr. xxv.
Milk of magnesia.....	Ounces ii.

Until healing is complete the cough is controlled, if excessive and irritating, by sedatives and expectorants; the larynx is cleansed several times a day by a one-half per cent formalin solution, followed by a daily application of 20 per cent argyrol, and if pain persists, the injection of orthoform emulsion, according to the formula of Freudenthal.

Immediately after the operation, as soon as bleeding has stopped, the stump is thoroughly rubbed with lactic acid. Heryng advises the use, at this time, of a 2 per cent alcoholic solution of malachite green.

To one who has not previously performed this operation two things are a decided revelation: The wonderful and almost immediate relief of pain and the insignificant amount of post-operative inflammation and discomfort, unless there are accompanying conditions themselves provocative of pain. Even in these cases the suffering is greatly diminished. One naturally presupposes a prolonged period of odynophagia and dysphagia, but in practice it is found that the odynophagia almost immediately disappears, that there is little subsequent soreness, and that deglutition, previously difficult or entirely impossible, becomes at once almost normal.

I believe it can justly be claimed that by this operation we save a certain number of lives that otherwise would most certainly be sacrificed; that in the vast majority, when a cure is not to be thought of, we effectually conquer the pain, and that we succeed, even in those in whom the suffering is not entirely controlled, owing to the presence of complicating lesions, in diminishing it to a notable degree.

DISCUSSION.

DR. WOLFF FREUDENTHAL, New York City:—I want to say that this is a very interesting paper and important to every one who sees a great many of these cases. I don't agree with everything the Doctor has said, because the results vary with the patients, the stage of the disease, and with the climate. I have seen quite a number of affections of the epiglottis, and if I give a percentage estimate of these cases of laryngeal tuberculosis, I think they amount to about 40 per cent, and all cases are included in that category, from the benign to the most distressing ones. I have had quite a number of such patients. I recollect distinctly about five or six, who came to me years ago with ulcerations of the epiglottis, and they are cured now since eight or ten years. Two are living here in the city, a druggist and a physician, and one a leading physician of Denver. I say we are able to cure such ulcerations by medicinal applications and by climate. For the benefit of the physicians of this city and neighborhood I would like to say that it is not sufficient to send patients suffering from laryngeal tuberculosis to Saranac Lake or Liberty. They may get there the benefit of experienced colleagues. In my experience, however, a great many of such cases cannot stand the rough climate of Saranac Lake, etc. They need a climate in the South or Southwest. Some patients have been benefitted simply by changing the climate. But the cure in these cases, I must admit, is not the rule; they are the exceptions, and I have placed down three indications for the removal of the epiglottis; that is, with due regard to the process in the lungs.

The first indication is when dyspnea is caused solely by the excessive growth of the epiglottis. I recollect two cases where the infiltration of the epiglottis was so large that the patients were suffering from dyspnea. After removal of the epiglottis the patients could breathe with perfect freedom. They remained in the sanatorium three or five months and then disappeared. Generally this is not the case, for when the epiglottis is so much involved, we have involvements of the arytenoids and the vocal cords, etc., as well. More frequently you see cases which form the second indication, that is, cases of rapid destruction of the epiglottis; the tissues seem to melt away under our very eyes, and to say when to remove the epiglottis in such cases is extremely difficult, and the most experienced colleagues may rightly disagree in a given case. For evident reasons, by removing the epiglottis in such cases we do not stop the ulcerative process, but frequently that goes on uninterruptedly, even if we operate, as Dr. Lockard says, in the early stage, which is not always advisable. Secondly, we cure a great many of such cases by topical applications. Only a short while ago a lady returned from the mountains suffering from terrible dysphagia. She was under the care of a good physician, but he had never examined her throat. After a few applications she felt entirely different, and in four or five weeks she was able to swallow perfectly and proceeded to another climate.

The third and most frequent indication for amputation of the epiglottis

is the dysphagia arising from pathological changes in the epiglottis. Here we have to differentiate again. Suppose we have a flattened epiglottis, on top of which very frequently are ulcerations. Most of these are of a benign character. They yield to treatment under lactic acid, chloride of zinc, nitrate of silver and emulsions of different kinds. But frequently we see a flattened epiglottis and see no ulcerations. We do not find any reason for the excessive dysphagia. In such cases very frequently ulcerations are on the lower or laryngeal side of the epiglottis.

In reference to the mode of operation, I use either the cold snare or any cutting instrument. There are a great many in the field. In addition to those mentioned by the Doctor, I will add one, viz., Prof. Alexander's of Berlin. He has constructed a very good instrument for amputation of the epiglottis. You may also use the double curette of Heryng.

This reminds me of an incident at Budapest. The first man I saw there was Heryng. He said, "Here comes a man who doesn't believe in surgical interference in laryngeal tuberculosis." Well, as a matter of fact, I simply do not believe in his manner, because he amputates every case he gets hold of, while his next door neighbor, Dr. von Skolowski, does not do these operations at all. There are surely cases which should be operated, while others should not, and that requires judgment. If the patient does not expect too much, he will not be disappointed.

I should like to ask if anyone has ever had a case of ulcerative stomatitis of the larynx. I had a young lady with very large faucial tonsils and an ulcer on the right anterior pillar, which I removed when I removed the tonsils. At the same time there was an ulcer involving one-fourth of the free edge of the epiglottis, which was through to, but did not involve the cartilage. This healed with the application of phenol and camphor. Later there were large aphthous patches on the cheeks and tongue with a history of frequently having such patches in her mouth. There was not diabetes and only a trace of albumin in the urine.

DR. T. E. CARMODY, Denver, Colo.:—I might answer Dr. Freudenthal's question by report of a case, an apparently aphthous ulcer of the upper border of the epiglottis. It healed in about ten days under simple treatment, and the cartilage was not exposed. It had all the appearance of an aphthous ulcer.

Of course, in a great many of these cases, the patient's vitality is low, and we find they are not in a condition in which we would recommend an operation, but most of these patients are unable to swallow any food, on account of the pain and fear of pain, so the removal of the epiglottis, doing away with the dysphagia, will allow them to take nourishment, and, in a great many cases, pick up for weeks and months, if they do not eventually recover.

Then in cases where the epiglottis is very much swollen it is tilted backwards, and you are unable to gain access to the underlying parts, and those cases, as in a case under treatment at the present time, a case of Dr. Lockard's, which he was unable to operate on account of an injured hand and which I operated for him, the ary-epiglottidean folds and the left arytenoid were very much swollen. This case was operated the third of March, 1909, the lungs clearing up inside of six months, so that the physician who was treating the general condition could detect nothing pathological, and has lately even advised that he be allowed to go to another climate on account of nervousness. In this case the man was running a temperature of 103 the day of operation. On the third day following the temperature was only 99, and remained around that for two or three weeks, when it became normal, and has been so ever since.

As for the removal of the epiglottis with the double Heryng curette, it is always necessary to remove it in small pieces. I have used the Spiess instrument on later ones. In one case with an infantile epiglottis I was able to remove it in one piece in something like a minute and a half. In other cases it may be very difficult and may take much longer. Pain has been relieved in all my cases with the exception of two, in both of which the ary-epiglottidean folds and the arytenoids were involved, therefore the pain was due to that cause as much as to the epiglottis.

DR. H. S. MILES, Bridgeport, Conn.:—I am an advocate of removal of the epiglottis. I think it ought to be radically removed. I reported a case twenty-two years ago of removal of the epiglottis for epithelioma, and at that time the remarkable thing about it was that the patient had no ill consequences in eating or drinking. It was done with a McKenzie epiglottome, very much on the order of the tonsillotome, which was curved so as to go over the tongue. Since that time I have removed the epiglottis with different forms of epiglottomes. The Heryng and other forms are too small, bleeding, gagging, etc., occurs. I think you had better take it all off at once.

DR. L. B. LOCKARD, Denver, Colo. (closing):—Each year of the past ten years I have become more and more radical in the removal of the epiglottis. Medicinal treatment unquestionably cures a certain number of cases, but for every case that can be benefitted in this way there are ten failures, and if dysphagia is severe during the time we are endeavoring to achieve a cure by local applications, the patient's vitality is rapidly destroyed, and then, if the conservative treatment has been unavailing, the prospect of permanent relief from the operation has been greatly lessened. For this reason, to remove the main cause of trouble before the vitality is hopelessly undermined, and because the operation, in so far as its effect upon the general health is concerned, is no more serious than the removal of a turbinate, it seems to me advisable to amputate the organ in every case where pain is severe or persistent.

DR. STEIN:—Do they ever recover? Are there ever any bad effects from the operation?

DR. LOCKARD:—No, sir. Unfavorable results, either local or constitutional, as a result of the operation, have never been experienced. Prolonged attacks of dysphagia, if severe, so impair the patient's strength that the entire process, local and constitutional, lights up, and the removal of pain gives them a chance to overcome the basic disease.

EXTENSION AND FLEXION IN DIRECT LARYNGOSCOPY; A COMPARATIVE STUDY.

RICHARD H. JOHNSTON, M.D.

Lecturer on Laryngology to the University of Maryland; Surgeon to the Presbyterian Hospital; Consulting Laryngologist to St. Joseph's Hospital; Consulting Laryngologist to the General Marine Hospital of Crisfield, Md.

BALTIMORE.

The development of direct laryngoscopy has opened up a new era in the treatment of laryngeal disease. Lesions, especially in children, impossible to diagnose and to reach with the mirror, can now be handled with comparative ease. To Killian in Europe and to Jackson in this country, we owe a debt of gratitude for placing the method on a rational basis. Improvements in instruments and technique have placed direct laryngoscopy within the reach of every laryngologist. When one becomes expert with the tube, he approaches all laryngeal lesions with greater confidence. It is only a question of time when it will replace the mirror for nearly all operative work in the larynx.

There are two methods of direct laryngoscopy: The one in which the head is held back in extension and the other in which opposite or flexed position is used. The former method has been used a long time; the latter, so far as I know, was first suggested by Dr. H. P. Mosher of Boston, and has greatly simplified the examination of the larynx and upper end of the esophagus in selected cases. We are all familiar with the extended position as practiced by Killian and Jackson, the latter of whom has given us an instrument which is very useful in both the sitting and prone extended positions. Before referring to the comparative merits of extension and flexion, it may not be out of place to describe briefly the method of extension which has proven most satisfactory to me.

A half hour before the examination, a hypodermic injection of morphia (one-fourth grain) and atropia (1/150 grain) is given the patient to relax the muscular system and to dry up secretions. He is seated upon a low stool and the pharynx and larynx are anesthetized with a 20 per cent cocain solution by means of Sajous forceps. After waiting a few minutes, the head is extended and supported by an assistant, and Jackson's separable speculum, with or without the slide, according as the patient has or has not good teeth, is introduced until the epiglottis comes into view. It is now necessary to use more cocain in the larynx with the special cotton carriers.

As one becomes more experienced little cocaine is required for examining purposes. The epiglottis and base of the tongue are pulled forward and the posterior wall of the larynx comes into view. If, at this point, the head be brought forward to a position midway between complete extension and the normal, erect posture, the best view of the larynx is obtained. During the past year I have operated in a number of larynges in the semi-extended position, the cases including singer's nodes, tumors of the vocal cords, subglottic tumors and thickenings of the posterior wall. If the neck is short and thick and the teeth large, examination in the extended position may tax the patience of the operator to the utmost. In some such cases it is well nigh impossible to see the anterior part of the larynx. Under general anesthesia in the prone position, the same difficulties are encountered; in holding up the base of the tongue, the strain on the arm of the operator is so great that it cannot long be maintained. In my earlier work under general anesthesia I was much discouraged with the direct laryngoscope in diagnosis and treatment; it was possible to see the posterior part of the larynx, but the anterior part of the organ always escaped me.

In April, 1908, Mosher published his "left, lateral route," which, briefly described, is as follows: The patient is etherized, the chin is slightly flexed on the chest, the left cheek is turned to the left until it almost touches the table; the operator sits comfortably at the left of the table and introduces the special spatula with the left hand. When the epiglottis comes into view, it and the base of the tongue are pulled upward by pressing the body of the instrument against the left, upper bicuspid teeth. A good view of the larynx is obtained; if the anterior part is not seen, an assistant pushes the thyroid cartilage backward. Mosher claims that in 50 per cent of cases the method is successful. It has been my privilege to operate successfully in one case with his special spatula. The objections to his instrument are that it must be used with a headlight which, in my opinion, is a disadvantage; it can be used only under general anesthesia, and it is cumbersome. For these reasons it is doubtful if it will meet with popular favor.

During the summer of 1908 it was my fortune to have under treatment a case of papillomata of the larynx in a child, four years old. The diagnosis had formerly been made in the extended position with the patient asleep. Attempts to remove the growths in extension proved very difficult. I tried in vain to use Mosher's instrument in the left, lateral position. The spatula

was so large I succeeded in causing trauma, but could not get a view of the larynx. A pillow was then placed under the patient's head to flex it on the chest, the mouth was opened and Jackson's child speculum with the drainage tube attachment introduced until the epiglottis came into view. This organ, with the base of the tongue, was easily pulled up and a perfect view of the larynx obtained. The papillomata were quickly cleaned out with Pfau's cutting forceps. I at once decided to try this method without anesthesia at the first opportunity, realizing that, if it could be done successfully, the value of the method would be greatly increased. My next patient happened to be a strong, healthy girl, six years old, with dyspnea. She was placed on the table, the head flexed on the chest, her legs, arms and head securely held by assistants, the speculum introduced and a clear view of the larynx obtained so that the diagnosis of stenosis was promptly made. Immediately after the examination the child immediately jumped from the table and, barring a slight increase in dyspnea, was unhurt. It can be imagined that, since the success of the straight, flexed method, I have discarded extension in children.

Instead of Jackson's old speculum with the drainage attachment, I now use the modified, child, separable speculum. The modification consists in having the vertical part of the handle of the separable speculum cut off and a screw arranged in it so that it can be attached or detached at will. When the vertical handle is detached the speculum makes an ideal instrument for the straight, flexed method; with the handle screwed in, the speculum is ready for the extended position or bronchoscopy.

I wish it distinctly understood that I claim nothing original for the above method. Mosher seems to have been the first to suggest flexion in direct laryngoscopy and deserves great credit for his discovery. The method described above will, in my opinion, be found superior to Jackson's instrument in extension or Mosher's spatula in flexion. The straight, flexed position can be successfully used in adults under general anesthesia. In my opinion nearly all such patients can be examined satisfactorily in the sitting, semi-extended position if the operator will have patience and perseverance. In only two cases have I failed to see the entire larynx at the second or third attempt in the sitting position. In one of these patients a thickening of the posterior wall was removed without the slide, while in the other patient a good view of the larynx was obtained, but the cutting forceps were not tolerated.

My chief purpose in asking your consideration of the two methods of direct laryngoscopy is to emphasize the superiority of the flexed method in children. We all know the difficulties which formerly attended the examination of the child's larynx with the mirror; we were fortunate indeed to catch fleeting glimpses of the pathological condition. The advent of direct laryngoscopy was hailed with delight as giving us an easy and efficient method of examining the child's larynx. But the tube in extension did not fulfill expectations. The cramped position of the operator, the tense condition of the neck muscles and the difficulty of using the instrument, proved great drawbacks. That the method was not entirely satisfactory is proven by the fact that such an expert as Mosher was seeking a simpler method. His "left, lateral route" was a step forward, but the cumbersome instrument places it beyond the reach of most of us. The straight, flexed position, as I have chosen to designate it, will, I believe, prove the simplest and most satisfactory for the majority.

To illustrate the simplicity and usefulness of the straight, flexed method, I wish to cite briefly a few cases.

(1) A girl, six years old, was brought to the Presbyterian Hospital with marked dyspnea, all the muscles of the neck and chest being involved in the respiratory act. She was placed on the table, her legs, arms and head held by assistants and examined in the flexed position without anesthesia. In a few seconds the larynx was exposed and the cause of the dyspnea seemed to be a web of tissue between the vocal cords anteriorly; posteriorly there was a small opening through which the patient was getting some air. We realized at once that it would be possible to intubate with a small tube.

(2) In December, 1908, I was asked to see a Bohemian child, fourteen months old, at the Garrett Hospital. She had been indubated for diphtheria three months previously and had had increasing dyspnea for two months. The patient was placed on a table and examination made in the flexed position without anesthesia. The vocal cords moved normally; in the subglottic space anteriorly, a grayish mass was seen, and posterior to this a small opening through which the patient breathed. The diagnosis of stenosis following diphtheria was made and the lesion located.

(3) A girl, two years old, was brought to the Presbyterian Hospital with dyspnea. She was examined in the flexed position without anesthesia. In a few seconds the diagnosis of papillo-

mata was made. Several physicians who were present saw the growths clearly through the tube.

(4) A boy, six years old, had been hoarse for some time. Examination with the mirror failed. The patient was put on the table and examined in the flexed position without anesthesia. The diagnosis of singer's nodes was promptly made.

The severest arraignment of extension in children is probably that of Bokay, in his exhaustive treatise, "Die Lehre Von Der Intubation." In the chapter on stenosis following intubation he says that Kirstein's autoscope is of no practical value in diagnosis; that Killian's speculum is not practicable on account of the difficulty in using it. He then pays his respects to the mirror method by quoting Hagenbach, who says: "If one has had a large experience in examining the larynges of children, he will occasionally be able to make a positive diagnosis of the condition."

At a meeting of the Baltimore Laryngological Society last winter I described the straight, flexed method of direct laryngoscopy. The other laryngologists present did not understand how one could see around a corner through a straight tube. At different times the method was demonstrated to them and they all agreed that it has a useful place in the diagnosis and treatment of laryngeal conditions in children. To those who have tried the extended method in children and feel that it is not all that could be desired, I commend the straight, flexed position for its simplicity and usefulness. We cannot all be as expert in the use of the extended position as Jackson, or in the left, lateral position as Mosher, so that something simpler is needed. If one will master the method described above, he will no longer fear any condition in the child's larynx. My confidence has increased greatly since the flexed position has given me such a safe and simple method of examination.

In conclusion I would call attention to the following points:

(a) Nearly all adults can be satisfactorily examined and treated in the sitting, semi-extended position with cocain anesthesia.

(b) The extended position under general anesthesia is difficult because of the cramped position of the arm and of the operator and the trouble in seeing the anterior part of the larynx.

(c) The straight, flexed position without anesthesia is the simplest method for examining the child's larynx for the majority.

(d) For the few adults who will not or cannot be operated upon by other methods, the flexed position under general anesthesia will solve the problem.

DISCUSSION.

DR. J. W. MURPHY, Cincinnati:—I think this paper and demonstration of Dr. Johnston's is very timely, and I believe by means of the methods he has given here we are going to be able to do a great deal more for these laryngeal neoplasms than Dr. Davis has explained to us today. I have only had experience in once case with the flexion method since this has been agitated, and that was a child, a year old, which had been intubated for diphtheria, and the tube had become lost; it was pushed through the glottic opening. I found considerable difficulty in getting a view of the larynx in the extended position, but by semi-flexing the head I was able to catch a glimpse of the glottic opening, and saw a cord or string of some kind hanging down into the œsophagus through this opening, and by grasping that with the forceps, was able to extract the tube without difficulty. I don't know of any surgical procedure we have to deal with at present that requires expert assistance so much as the use of these tubes. The great difficulty in most cases is an over-extension of the head. Unless the assistant holding the head is experienced in his work he will over-extend it, which will give us a great deal of difficulty in getting a view of the anterior portion of the larynx. As you are interested in your tube, you forget what position the head is held in. I have found the Jackson speculum very serviceable, but the small electric lights are so uncertain that I never feel safe with them. While in London last fall I was with Dr. Tilley in a number of operations in the office, in which he used the Bruening set of tubes, and he uses it there almost as a routine examination, picking up the tubes and making the examination, and removing neoplasm through them without any previous preparation. I find the Bruening instrument very satisfactory in office work, in that you have a powerful source of illumination, one that does not fail you, and one which is very quickly used.

In all these cases in the extension method sometimes difficulty is experienced if the upper teeth are unusually long and so great damage may be done to the patient, and unless the assistant watches the upper teeth, the lips may be caught and a great deal of damage done. I now have the assistant always place a napkin in the mouth, holding the cheek and lips away from the teeth.

In the majority of these cases in adults coming in with a history of foreign bodies having been swallowed, the upright position, of course, is much simpler, and under local anesthesia it is a very simple procedure. I feel with the instruments at our disposal that we should have very little difficulty in diagnosing neoplasms in the larynx or œsophagus, and I cannot conceive how a foreign body the size of a pea could escape notice if it is in the œsophagus or trachea. Of course, if it passes off into one of the bronchi, it might be more difficult to remove. Possibly those who were present at our meeting in Cleveland witnessed the demonstration, where a child had a history of having swallowed a peanut. I made an attempt at extraction without success. The peanut had gone off into one of the bronchi. Dr. Lenker reported to me the following day the child was very much improved; by some method the foreign body had changed its position, so the child was breathing more freely the following day. However, it maintained a septic condition for some three or four months, when during a severe coughing spell one day a portion

of the peanut was expelled, and the child made a rapid and uneventful recovery.

Many people come into the office with a very indefinite history. For instance, a woman came in a week ago today, with a history of having swallowed a bone a week before that. Asking her what kind of meat she had been eating, and she answered, "Tongue." I made a very thorough examination of the œsophagus under local anesthesia, passing the œsophagoscope down to the diaphragm, and there was no evidence of any foreign body being present. There was at one point a scrap of mucous membrane where something might have caused a slight injury. Another case came into the office after several attempts had been made to extract a tack. A man was putting up posters on a telegraph pole, and had a mouthful of tacks, and while looking up one of the tacks was swallowed. His physician had made attempts at extraction, and claimed to see the object, before he was brought to me. There was a great deal of edema about the glottic opening, and yet the patient was positive the tack was there, though I could not see it. As I felt with a probe, he would tell me that I was touching it. After using the instruments for some little time, I decided to take an X-ray, which showed no tack present. It might have been swallowed and coughed up again before he came under observation.

By placing a tack on the outside at the supposed place of lodgment, and looking at it with the fluoroscope, it was very easily seen. A case came into the office last week that had swallowed a pin four or five days before; she couldn't remember just when. It happened some time before, and she had made up her mind that she had swallowed the pin. I refused to make an examination with the tubes until a radiograph had been taken. The technique of these operations is somewhat difficult, and I refused to do anything at all until an X-ray had been taken, which showed positively there was no foreign body present. In these cases I do not think we are justified in searching in the dark. It is difficult enough to find them when we have positive evidence of their presence, but I think the method advocated by Dr. Johnston will be found a distinct advantage. One of the great difficulties at the present time is a multiplicity of instruments. I think we have four or five times as many as we need, and all that is necessary is to simplify rather than multiply.

DR. EMIL MAYER, New York City:—The conclusions arrived at by the speaker in regard to the question of operation on malignant growths are certainly the conclusions that most of us have arrived at. The picture dramatically as it is presented of a patient in the throes of terrible dyspnea is indeed a tragic one, but we have the power relieving them at once, by a tracheotomy at any rate. The question arises, however, in these cases, are we always, or nearly always reasonably right? There is hardly a laryngologist who has practiced a number of years but has felt in some cases or another that malignant disease was present, and a diagnosis of malignant disease was made by himself or his colleague. The patient was told an operation was absolutely essential, and the patient refused it, and in spite of our wisdom the patient has apparently remained well. On the other hand we make a diagnosis of a probable malignant disease. I recall only recently a report by Harmon Smith of a case shown by Dr. Gleitzman in the New York Academy of Medicine eighteen years ago, a man with a very peculiar horny deposit situated, I believe, on the right ventricle; it was like a mass of cotton that was placed within the larynx and believed to be malignant, and yet this man lived for eighteen years, and only so late as that had a condition sufficiently serious to require operation. On the other hand, I saw only recently at Budapest a patient who was operated on by Prof. Chiari, a young girl twelve

years of age, whose malignant growth was removed and she was in good voice and apparently in good physical condition. I listened to a very illuminating and beautiful address by Mr. Bashford at the same Congress, in which he showed a number of illustrations of mice that had been operated on for malignant disease. He brought out some facts that were singular and new. I was not aware, for instance, that cancer existed to such an extent in fish. They had 2,500 cases of cancer in trout, a thing that to me was particularly interesting, and certainly new, and I think to most of the hearers present. He showed among other things that the average duration of a mouse's life was twenty-one months. This mouse afflicted then with a sarcoma was operated on, and attention paid as to the length of time it lived without recurrence, and figuring relatively the number of years that a human being had to live and the number of months that this mouse lived without recurrence, it was shown conclusively that operation certainly prolongs the life of the object operated on.

Mention has been made as to the use of applicators for cocaineizing, particularly the lower portion of the bronchi. A very ingenious little instrument has been devised by Kahler, who is Prof. Chiari's first assistant, which enables one to spray the interior of the larynx, after the tube has been introduced into the upper larynx. It is not an expensive instrument and consists of a small bottle in which the cocaine solution is placed, and a long tube, like any one of our long applicators, and with the pressure of a hand bulb a very fine spray of cocaine is introduced into the trachea. Regarding the Bruening hand lamp, mention of which was made by Dr. Murphy, there is one objection to it, and that is when you go to extract anything or introduce your instrument first, it is necessary to swing the lamp off to one side, so that you have to go off to the right. This has been improved, so that the new Bruening lamps now do away with this, and it is now made so that the lamp swings over in half, and you can introduce your tubes in a straight line. Kahler himself, however, has made what to my mind is a still better lamp, and you can imagine how much better it is when I tell you that I had a Bruening lamp and bought the Kahler lamp also. This hand lamp is a very practical affair, and is in the line not of a new instrument, but an improvement over the old.

In regard to the Hayes instrument, I am informed by the manufacturer that he has devised a lens which is going to obviate some of the objections of this particular kind that Dr. Beck speaks of, and will show the objects very much larger, which is to be placed in the same instrument, and which he is going to exchange for the old instruments when ready.

DR. JOHN MCCOY, New York City:—I should like to endorse the views of Dr. Johnston. The Doctor and I have had some communication, and we have been using practically the same method for the last two years—the injection of morphine and atropine half an hour before the operation of direct laryngoscopy, when practicable, with cocaine. The Doctor first called my attention to it after I had published an article, in which I suggested direct laryngoscopy under ether anesthesia. Latterly I have been using the speculum of Mosher, and find it particularly useful in children.

There are several things that appeal to one in the technique of direct laryngoscopy as perhaps a trifle incomplete. In the first place, it has always seemed to me that while we had plenty of illumination above the cords, we had very deficient illumination below the cords, so that I experienced difficulty in accurate removal of growths for that reason; and, lately I have been using a combined light; that is, in addition to the light thrown into the larynx from above, either with the Mosher speculum or the small lamp in the Jackson speculum, I have used a transilluminating lamp

placed on the trachea, and in that way the trachea was illuminated and gave me light from below, so that I was able to do much more accurate work than without.

In the next place, I have had two cases in which the ordinary forceps were not applicable; in other words, they were cases in which an infiltration occurred in the anterior portion of the larynx; the infiltration was rather dense, and, as you know, when we press the instrument against such a mass, the larynx moves and the instrument slides off. In other words, I could not get a good portion of the growth for examination or ablation. This led me to devise a tip for my forceps, which I have used very successfully. The idea is to have a scalpel point on the instrument, plunge it into the growth first, and the cutting portion comes afterwards.

Until Dr. Mayer spoke about it, I did not know that Dr. Kahler took the credit for devising the long spraying apparatus, because I have been using it one and a half years myself. When in Berlin a year and a half ago I had one made to my own order. It certainly is a simple apparatus. The long tube is passed down, and it is surprising how quickly the field is anesthetized and how much less traumatism is necessary than when we use the applicator.

DR. JOS. BECK, Chicago:—There have been a few methods of diagnosis alluded to by Dr. Davis in the early recognition of malignant growths with which I have had some experience. First, the blood examination or haemolytic test. I had a patient, a man forty years of age, a fruit pedlar, and he had had a hoarseness existing for some time. He was examined by Dr. Ingalls, and the case was diagnosed as non-malignant—a fibroma. The condition, however, did not improve, and the patient consulted me. I had a haemolytic test made. I removed the growth in seven pieces and made a serial examination of the seven different portions. Five of them showed simple adeno-fibroma, and one typical epithelial whirl. Now one whirl doesn't make cancer, but it is suggestive, as the haemolytic test was positive, and it remains to be seen whether that was carcinoma or not. This was more than six months ago, and there has been no recurrence. The man has a good voice.

In reference to the Hayes instrument, I have used this instrument for laryngological examination, particularly however for adenoid examination, and find it very serviceable. The only difficulty is that the distance is so great it makes objects look so small. Nevertheless growths of any size can be seen by this method of examination, and I think it is one of the best instruments I have ever had in use for that purpose.

Now I would make a point in regard to X-ray examination alluded to, but not by the speakers. I simply mention the fact that in making the examination for foreign bodies in the bronchi one should not take single pictures. While you are taking a picture, take two, that is, take a stereoscopic picture; it gives the foreign body in its position anteriorly and posteriorly. This has been one of the criticisms of the X-ray plates, that the distance was not given. So far as the instruments used, I had a case, in fact, the only case I had of a real foreign body in the bronchus, a little toy electric lamp in the left bronchus, wherein I employed the Bruening apparatus with success, but I have made it so that I can apply the Bruening handle to the Jackson tubes. If you do have to sidetrack or turn this lamp, you still have illumination of the lamps.

DR. JOHNSTON (closing):—I must say that I have had very little trouble with my lights. I use them carefully with Dr. Jackson's dry cell battery, and it is seldom that I have any trouble with them. I think there are entirely too many instruments for direct laryngoscopy and bronchoscopy.

I have used Jackson's instruments only and have found them satisfactory. I have gotten so I can use them, and I am not accustomed to others, and I suppose that is the reason. But every time I use them I am more impressed with what Dr. Jackson has done for suffering humanity.

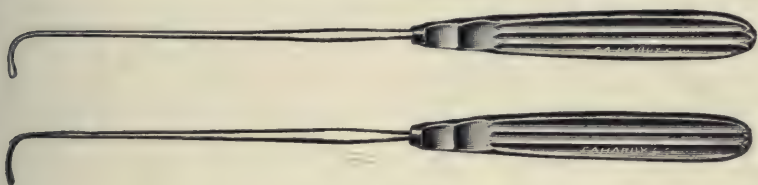
PAINLESS AND BLOODLESS TONSILLECTOMY WITH DESCRIPTIVE TECHNIQUE.

OLIVER TYDINGS, M.D.

CHICAGO.

The technique of this operation was in process of development for two and a half years and during 1902 and 1903 demonstrated weekly at the Hospital of the Chicago Eye, Ear, Nose and Throat College. As now practiced it has been unchanged for five years, with results that are as satisfactory to the patient as they are gratifying to the operator.

The only instrument of my design which I still retain and occasionally use is the blunt dissector (Fig. 1). My first knives all had straight handles, but the cutting edges were made in different lengths and angles, and while with them I could do clean and beautiful work, yet I felt they were not all that could be desired. With the advent of this knife (Fig. 2), April 30, 1904,



Figs. 1 and 2.

I felt I had one as nearly perfectly adapted to the work to be done as was possible to make, a belief which is justified by experience and corroborated by the experience and opinions of others. It has been commended in two recent articles, one by Dr. Stubbs, another by Dr. Freer, both of our city, and privately to me by scores. The forceps (Fig. 3) I picked up so many years ago I have forgotten where or when. In Chicago it is known as mine, but the only claim I make is in recognizing a good one so long ago, and I reverently lift my hat to the man whose brain so many years ago conceived an instrument the world has not improved upon today. I had another fashioned after this, with tissue-holding points, to be used when one has accidentally cut off the top of a tonsil and has not left stump enough to be picked up with the volsellum tip. It can then either be dissected out or it can be removed by throwing the snare around it.

Until 1904, on account of the method of using cocain and adrenalin by external application only, the operation to be altogether painless was tedious and somewhat bloody, but since using them hypodermically the time has been so shortened that it is rare indeed to be over fifteen minutes from the first application of cocain until the final removal of both tonsils. Of this time, perhaps ten minutes are given to preparation and less than five to actual work.

The instruments used in this work are not all of my own design. The first—the hypodermic syringe—came into existence some years before my time. The one in general use is not without objection, as with the long canula attachment it is not an ideal instrument for any work. There are two excellent instruments on the market, one by Ferguson of Philadelphia, another

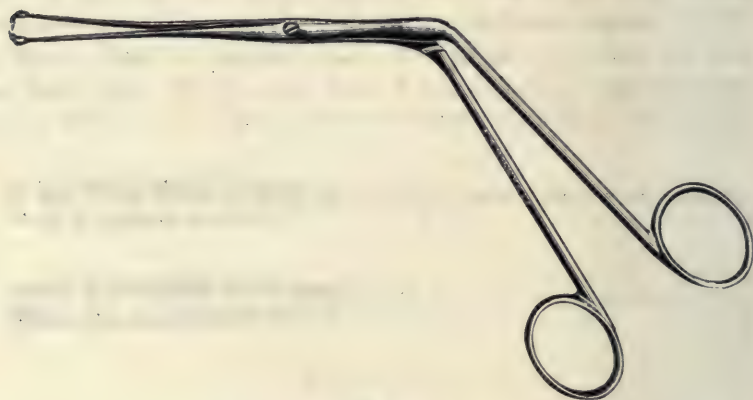


Fig 3.

by Pynchon of Chicago. The tongue depressor of the latter is equally as satisfactory for use in local anesthesia. The sickle knife (Fig. 2) is a very satisfactory one indeed, but the point must be dull to follow the natural line of cleavage, which a sharp-pointed instrument will not do. In order to keep the point dull, never send it to an instrument maker to sharpen, but have a conical Hot Springs stone and do your own sharpening. This is the first knife (Fig. 2) of its kind ever made; has done good service; is somewhat worn, but the point is as good as when first from the shop. I exhibit another which was sent to the maker to be sharpened, with most disastrous results. The blunt dissector (Fig. 1) you will need perhaps two or three times in a hundred cases, and then it is not indispensable but useful when, from recurrent and recent peritonsillitis, with or without abscess

formation where the control of hemorrhages is not so easy, it enables you readily to clean out the supratonsillar fossa without endangering adjacent structures.

The snare (Fig. 4) I designed early in 1902. It was delivered to me in April, 1903; about a year afterward I first took the concept to one instrument maker, who kindly sent me to another, who, seeing the commercial value of it, "took me in" and patented it for his own use and benefit. It has been listed as the offspring of other brains, none of whom has, so far as I am informed, even taken the courtesy to deny it.*

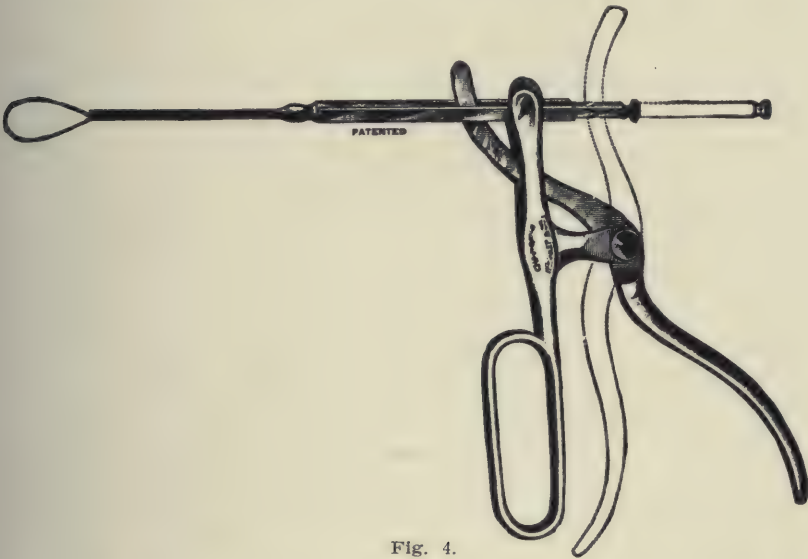


Fig. 4.

You see, it is a heavy snare designed for heavy work, has a lever action, takes a short wire five inches long and one threading does for both tonsils. You will find a number nine piano wire best for this work, as it is sufficiently stiff to be pressed around the tonsil without the use of the Veder tip, which is the only idea the patentee furnished. It was not on the first one and is worse than useless. One advantage of this snare is that, be an operator ever so careful, now and then with a restless patient he will draw his loop down and find he has not engaged the whole tonsil with it. He can then easily let go and after he has engaged it within the grasp of the loop, he can follow it until the tonsil is shelled out.

*I hope the circular and receipt which I exhibit will settle for all time the question of design.

Technic.—Under local anesthesia, with the patient in the sitting position, apply 20 per cent cocain solution to the tonsils and mucous membrane of the pharynx, then an application of Sol. Adrenalin Chlor. 1/1000 and follow that with the second application of the cocain. The solution for hypodermic use consists of:

R

Cocaine Hydrochlor., $\frac{1}{3}$ gr.

Sol. Adrenalin Chlor., 1-1000, M. 20 to 30.

Aquae, $1\frac{1}{2}$ drachms.

Prepare fresh at the time of using. Inject 20 mm. of this solution in each supratonsillar fossa; 10 mm. each in the following places: Between anterior pillar and tonsil, between posterior pillar and tonsil, and at the base of the tonsil. These four injections to each tonsil are outside of the tonsil in the loose connective tissue which surrounds it. Sometimes you will accidentally pierce the capsule, when you will see the fluid pour out of a crypt. These injections are made not only for the purpose of relieving pain, but of controlling bleeding as well. After a delay of four minutes you are ready to proceed. Say to your patient, "If you have pain, tell me and I will stop; you must have no pain." Have a nurse steady the head of your patient; this is not absolutely necessary, but is desirable. Give the patient a Pyncheon tongue depressor and have him hold down his own tongue. It not only gives him something to occupy his mind, but he can do it better than anybody else. At the same time have him breathe regularly. Seize the tonsil with a pair of forceps and draw forward and towards the median line. This lifts it from its bed when not adherent and maps out the contour of the tonsil; then, with the knife, make an opening through the mucous membrane, which is a good plan for beginners, but after you have done a few hundred of these operations you will find it just as easy to include the deeper attachments. In your first dissection, always hug the tonsil as close as it is possible. Your effort should be generally directed first to the supratonsillar fossa, and when you have freed the vela lobe then follow along down, anteriorly or posteriorly, which ever may look the easier or more convenient to follow. When you have finished encircling the tonsil you will not only have severed all the mucosa but all tissue necessary to engage the tonsil within the loop. Another advantage of this snare is, should you find you have made an error in your calculation and have not the tonsil free enough to have the wire follow the natural line of cleavage, which can be told in adults by the lessened resistance it furnishes as com-

pared with a fibrous tonsil, you can readily remove it and sever such bands as may be necessary to make it follow the line of cleavage. When once engaged, all you have to do is to press the handle, and the tonsil is shelled out in its capsule, leaving a smooth fossa free from tonsil tissue. I generally dissect both tonsils before removing either. Another advantage of this snare is when you have removed one tonsil you can have it ready for action again in the fractional part of a minute by using the same wire. But now and then you will cut off a tonsil. What, then, is the mode of procedure? Why, just catch the remaining portion in a pair of forceps, and for that purpose this form (Fig. 3) is better, and dissect it up and remove it, or you can engage it in the loop of your snare.

A common error with all snares is in having your loop too large; an inch loop is long enough for the largest tonsil. As soon as both tonsils have been removed, apply tannate of glycerine to the denuded surface and then give the patient Sol. Carbolic Acid mm. 15 to 8 ounces of water, preferably hot, to be used as a gargle as frequently as he pleases. This is given for its analgesic action, something I have never seen mentioned in connection with this work, but I do not know of anything as grateful to a patient for the first twenty-four hours. After twenty-four hours have the patients use a gargle of Hydrogen Peroxide (diluted three or four times with water), three or four times daily. They are still directed to use the phenol solution; but, generally after forty-eight hours they drop it, as the necessity for using—the raw feeling—has passed. Continue with the peroxide for a week, or as long as it affords relief. After the third day have the patient apply equal parts of Tr. Ferri Chlor. and glycerine once a day for two weeks. This idea I got from Dr. Pyncheon. This is to lessen the deposit of granular tissue, which leaves a smoother surface with pillars more pliant.

Under general anesthesia the technic is the same, excepting you do not use cocain. However, use the adrenalin chloride solution 1/1000, 10 to 15 mm. to two syringes of water, to be divided between the two tonsils, all of which in children is thrown into the supratonsillar fossa.

For an anesthesia, I prefer ether for throat work, for, while it increases secretion of mucus, yet the anesthesia is more prolonged and you can generally remove both tonsils and adenoids without the necessity of renewing it. The solution of adrenalin chloride is used five or six minutes before profound anesthesia is reached, for the purpose of controlling hemorrhage.

The position of the patient is different from any I have seen described, but if once tried will be continued. It is a semi-dorsal decubitus, with body on an incline of ten degrees, with head occupying the lower angle. This is done to get the mucus and blood, if there should be any, into the upper part of the pharynx, where it can be readily wiped out. The face is turned up at an angle of forty-five degrees, so that your light can be thrown down (not up), the operator standing. If operating on the right tonsil, your patient's face should be turned to the left—the operator standing on the left side; and, when operating on the left tonsil, the face is turned to the right, the operator standing on the right side.

You will need two other instruments in this work. I prefer Stubb's modification of Murdock's mouth gag, and a short handle tongue depressor, so the patient's chest will not interfere with the work. Another thing you will need is a half dozen cotton sponges previously dipped in boric solution, on hemastatic forceps, to wipe away the mucus and blood, if any, from upper part of pharynx, where it collects.

I have not said anything about hemorrhages. I do not wish to be understood as underestimating tonsillar work. There is not a more difficult procedure in surgery than a tonsillectomy under general anesthesia. And yet I say to you with confidence born of seven years' experience in this particular operation, that the danger from hemorrhage is very slight. Still, I find myself every year taking greater precaution to prevent the possibility of it. Hemorrhages are of two kinds, immediate and consecutive. Immediate hemorrhage is rare indeed. The title of this paper speaks of bloodless, and when I say bloodless I mean where not more than a teaspoonful or two is lost. That is the general rule, but where you have had recurrent attacks of peri-tonsillar inflammation, especially if recent, you may lose a few ounces, but such a thing as a dangerous hemorrhage—say eight ounces, which would not be dangerous—at the time of operation has never occurred in my practice. I have taken no other precautions than those set forth. Of consecutive hemorrhages, I have had reported to me six cases, three of which I saw, but as the hemorrhage had been arrested before my arrival, and in each case by the application of *Liq. Ferri subsulphatis*, which, I confess, next to tannate of glycerine would be my choice of styptic if I were on the ground. The other three, one a hospital case stopped by a nurse; another doctor, who stopped his own; the third I do not recall, but it could not have been severe or I would have remembered it.

The only instruction I give in reference to hemorrhage is to call a nurse or doctor the instant it starts and have it arrested. The patient sleeps in any position he pleases. I know the hospital cases are given a single pillow, generally, and a half grain of codein or a hypodermic of morphine, if they have pain.

I cannot close this article without commenting upon an instrument which is still advised by some otherwise able men. I refer to the tonsil punch. I have not used one in seven years. I challenge any man to produce a tonsil or part of a tonsil which I cannot remove by my process and say to the users of any and all tonsil punches that clean work with one is an impossibility.

DISCUSSION.

DR. JOHN W. MURPHY, Cincinnati:—I have used the method described by Dr. Tydings for several years and find it very satisfactory. I did not know who was the author of that knife, but I began using it several years ago. I first pass the knife up into the supra-tonsillar fossa and then swing it down along the anterior pillar first, and then up and down the posterior pillar. As soon, however, as I get the opening made I am partial to doing the rest of the operation with my finger, and in several instances before the finger came out, I have brought the tonsil out. I have to have two of those snares. I find in using the heavier wire, after having drawn it into the canal once or twice, it is apt to break. I had that happen twice last week.

I have not been able to do a bloodless operation. I never try to do a bloodless operation, but the operation has been very satisfactory.

DR. G. THOMSEN VON COLDITZ, Chicago:—I use the method mentioned by Dr. Tydings, e. g., cocaine and adrenalin anesthesia, and find that the operation can be done with absolutely no pain.

A few of my cases, however, developed quite a bit of hemorrhage, during operation, some an alarming hemorrhage several hours after operation. In the latter kind, clamping was necessary for control, and in one case its use was required for thirty-six hours.

My method in the use of tongue depressors has undergone some change. During the last year, while using Dr. Pyncheon's instrument, held by patient himself, with the idea of diversion, I found that in some instances the patient, becoming hysterical and frightened, allowed the depressor to interfere with the work. Since then my assistant always holds the depressor, permitting much more speed and comfort.

I use the knife to loosen the anterior and posterior pillars and the mucous membrane of the superior tonsillar fossa, allowing the freeing of this part of the tonsil, so that the gland itself may be pulled forward. By blunt dissection I then enucleate the tonsil in capsule, cutting only at sight of vessels. The base of the tonsils, the lingual tonsil, which is usually adherent to the base of the tongue, I then loosen with my scissors.

The scissors, which I originated about five years ago, work on the principle of the alligator forceps and take up little space in the mouth, giving the operator a good field of vision.

DR. H. A. BEAUDOUX, St. Paul, Minn.:—I was glad to hear Dr. Murphy speak of the use of his finger, as I have found it a very useful and safe dissector. I was off on a hunting trip about a year ago, and before I left town I was asked to operate on a few cases of adenoid and tonsils, so

not being properly equipped in the country doctor's office, we devised the best means we could to do these adenoid operations, and having nothing but a student's lamp set on a stool close to the floor, with the head of the table to the window, I was unable to use the lamp light, it being so low and inadequate that I resorted to the use of my forefinger entirely in my dissections. I operated on eleven cases in that manner, using either snare or tonsilotome to cut out and extirpate tonsil once dissected. It is not difficult in most cases to enter the supra-tonsillar fossa and to dissect the tonsil to its base, then grasping the tonsil through the loop of a snare or tonsilotome, it is readily cut and extirpated. My forefinger is the only dissector, except in a few cases where I preferred using a blunt dissector to enter the fossa, that I have used in the last two years, and I have done over 600 operations in that way. I consider it much safer than any other, as it enables one to know where and what tissues the operator is working upon.

DR. JOHN F. BARNHILL, Indianapolis:—Dr. Tydings has well said that there are two operations to be considered; one performed with and one without an anesthetic. The one without an anesthetic has today become much simplified, is a comparatively easy one, and I believe most operators are following the method described by Dr. Tydings. The last two or three years I have used exclusively, instead of cocaine, alypin, and this when used with adrenalin chloride makes as nearly a bloodless and painless operation as we can hope to do. Although, I must admit that in my office and in my tonsil work generally I have more bleeding than Dr. Tydings has told us about. In fact, I think we should expect it at all times. Under a general anesthetic the operation is very much more difficult, and one of the difficulties, at least with me, has been to get some one to properly hold the tongue. Some years ago I first tried Whitehead's mouthgag, which I here present, and have found it most helpful. But I found also that if the patient was not deeply anesthetized, he would roll his tongue under the tongue spatula of the instrument, as originally devised, in such a way as to obscure the view of the pharynx and tonsils. I have, therefore, had the spatula shortened about a third of an inch less than you see it here, and have three hooks, about a quarter of an inch long, put on the under side. This modification makes for me a perfectly satisfactory mouthgag and tongue depressor combined, and I believe if you try it you will agree with me that it is a real help in operating. The patient is anesthetized, the child brought forward and put in an assistant's lap; then I take a tongue forceps and draw the patient's tongue firmly forward over the teeth, then the assistant holds the tongue in that position until this mouthgag is adjusted and the spatula with the hooks is put upon the tongue where the latter is so held that it cannot be drawn backward and obscure the view.

This procedure gives, therefore, a perfect view of the tonsils, and by operating rapidly, just as you would without an anesthetic, the hypertrophies can be removed in a satisfactory way in two or three minutes.

DR. HOWARD PYFER, Norristown, Pa.—I have tried cocaine and adrenalin by injection, but I found that patients gasp for breath, become highly nervous and hysterical. For the past year I have used suprarenin and novocain in hypodermic tablets, prepared by Sharp & Dohme. An injection of this preparation gives a bloodless field and anesthesia. At each meeting of a medical convention I have listened to some new method of operative procedure, and after coming home and trying it I discovered that it was not always feasible or safe. Last June at the A. M. A. there were a number of methods advocated. Richards proposed a bloodless dissection with the finger, removing the base if necessary with a

wire snare. On returning home I tried this method and since then have discarded instrument after instrument. In some few cases where the adhesions are very dense I used the Doctor's dissector, but more frequently find the tonsil coming out easily and entirely by the finger dissection. One could use a tonsillotome from which the forks have been removed to quickly take off the base. After the tonsil has been dissected, should there be an oozing or even a severe secondary hemorrhage, sewing together of the pillars and allowing the stitches to remain over night readily controls what could easily prove quite troublesome and annoying, if not dangerous to the patient.

DR. W. L. BALLENGER:—I have been very much interested in this paper and the discussion. The bloodless and painless removal of the tonsil is always an interesting subject. The first remark to be made is that it is not always painless, and the second, it is not always bloodless. In fact, Dr. Tyding's operation is not bloodless; it is, he says, attended by just a little blood, a teaspoonful or two; occasionally it may be a quart or two. The most severe hemorrhage I ever had followed the use of the snare in the removal of the tonsils. The patient was so exsanguinated that he was in bed three weeks. So the snare is not exactly a bloodless method. Blunt dissection is supposed to be followed by less blood than sharp dissection. My experience is, the sharper the knife, the less hemorrhage you have. I use a very sharp scalpel for the dissection of the tonsil, and I have had very much less hemorrhage from sharp instruments than with blunt dissection with the snare. The method that the Doctor describes formed the subject of my thesis before a meeting of the American Laryngological Association four years ago. I used the Kyle knife to free the pillars and an ecrasseur to complete the operation. Of course, you all know that Dr. Pyncheon has been removing the tonsil in its entirety for twenty years, but he didn't claim to remove the tonsil en masse with its capsule intact as first recommended by me ten years ago. Ten years ago I tried to remove the tonsil with its capsule intact. I have never argued that any one technique should be observed, but that the tonsil should be removed with its capsule intact.

DR. CHARLES M. ROBERTSON, Chicago:—There is a great individuality among patients; some patients will let you cut their legs off, and not feel it at all, while with others a pin scratch will cause great pain. So that no local anesthesia, be it what it may, cannot be a painless operation in all cases. The only painless operation is when they are dead to the world, either from ether or gas. The dissection of the pillars I have always haggled over, but I have not done so as much as some of you, because I only separate the anterior pillar; the rest of you separate all, the surrounding tissues and both pillars. I never could see the beneficial effect of a snare. You cut around everything; why do you not go a little further and not need the snare. It seems to me that finger operations should never be mentioned in a medical society. I do not believe you would like one of your family operated on for appendicitis with finger nails. You are so eager to get the tonsil out with a capsule around it that you do not think anything about the function of the pillars the patient wants to have after you get through with him. The palatal arch and the pillars have a function in regulating the voice, and it seems to me there ought to be some way of doing this operation without bruising either by a punch forceps or a snare, or by the finger.

As regards tongue depressors, I could never see any reason for three or four assistants holding a tongue depressor. You do not need a tongue depressor after you get hold of the tonsil with a forceps. You can pull the tonsil in far enough so you can look at it over the tongue and dis-

pense with the tongue depressor altogether. I never need a tongue depressor, especially in local anesthesia.

I have noticed in operating that in some patients one side would bleed remarkably freely, and the other side wouldn't bleed at all, whereas there was no appreciable difference in the appearance of the tonsil. I have also had pulsating tonsils that did not bleed at all.

DR. JOSEPH BECK, Chicago:—I feel more like discussing Dr. Robertson's remarks than the paper, because he made it very strong about the finger dissection, and I put myself on record that I use the finger on children in general anesthesia, and I believe it is an absolutely surgical procedure. Every surgeon uses his finger to liberate a tumor, and after the tonsil is freed from the pillars it is a tumor. I do it gently and use a piece of gauze over the finger. It is surprising how easily it is shelled out with the finger and gauze. I think Dr. Robertson should try it oftener and then he would not be so opposed to the method.

In regard to the other points discussed, I am in accord with Dr. Balenger as to bleeding. Now if you know where an artery is, you can grasp it before you cut it, and in this bloodless method in adults it is exactly what I do. When you reach the posterior lower border you pull the tonsil out, you see the fibers, and within them are the vessels. I have made serial section of the entire tonsil and have located the tonsilar artery. I believe the base of the tonsil best removed with the snare; it is quicker and without the loss of much blood.

As to the injections of adrenalin and cocaine, I always make it very superficial in forms of blebs. The reason for this is that the mucous membrane is the most sensitive structure and from which there is considerable bleeding that is annoying during operation.

DR. GLEASON:—There has been so much said that I will speak very briefly. You can always secure a painless tonsillectomy by the administration of ether; and I think where the patient is not decidedly opposed to ether you had better operate under ether. So far as the technique of tonsillectomy is concerned, it is largely a matter of the surgeon's habit as to which instruments he employs, because of his consequent skill in their use. At the present time I use a sharp tenotome, dragging the tonsil, but not very strongly, into the center of the pharynx. Then with a sharp tonsillotome, keeping close to the tonsil, I dissect the pillars loose. If necessary I stop at any stage of the dissection to introduce Dr. Robertson's knife, which is similar to Seiler's septum knife, by which you can often dissect the pillars loose with one sweep anteriorly and then posteriorly. Then I introduce my finger—and I will say that my finger is a great deal cleaner than any mouth, and if there is to be any infection after the hands have been cleaned up in the regular manner, I want to say that the infection will come from the mouth. After the dissection is well done, and that is an important part, the tonsil only should be attached to its bed by its lower third. It is a matter of no consequence whether it is now cut entirely away with a knife, scissors or snare. I rather object to most tonsil snares on account of their size and clumsiness. I have gotten back now to the ordinary Jarvis snare, of sufficient size to carry a No. 8 or 9 wire. I think it is of the utmost importance that the loop of your snare be small, so that when the tonsil is dragged through this small, stiff loop, the pillars are pushed aside and no structure except the tonsil removed. I am speaking now of a small snare and general anesthesia. Without general anesthesia a small snare is too slow and Tyding's snare the preferable instrument.

DR. F. H. KOYLE, Hornell, N. Y.:—The various gentlemen who have spoken of adrenalin seem to have forgotten that there is more danger

from post-operative hemorrhage than there is from hemorrhage which occurs during the operation. I protest against the use of adrenalin in tonsil operations, especially in flabby, moist conditions of the mucous membrane. I have invariably found some slight post-operative hemorrhage after the use of adrenalin, and very little if adrenalin is not used. Cocaine may be used freely, but I believe we will soon learn that adrenalin would better be abandoned. If we are going to have any hemorrhage it should be during, and not after the operation. The technique of the operation varies, of course, with one's personal choice of methods and instruments. The only instruments I use are a pair of Holmes' nasal scissors, the Tydings snare and tissue forceps. I have had the scissors, right and left, serrated, and find the curve of the blade ideal for a dissection of the pillars from the tonsil.

DR. McCLELLAN :—One point I had hoped would be dealt with a little more thoroughly, and that is regarding a general anesthetic. To my mind, in doing a tonsillectomy under a general anesthetic, the anesthetic is the most serious part of the whole business, and the degree of the anesthesia which should be employed. A few months ago I had the pleasure of seeing Dr. Waugh of London doing some work along this line, and he uses chloroform and makes a very deep anesthesia. His claim is that with the deep anesthesia the reflexes are abolished, and there is no hemorrhage. And there wasn't any hemorrhage during the cases I saw him operate on. He has a record of some 2,000 cases with no history of danger from the anesthetic. It worked beautifully, and he uses nothing but a pair of forceps to pull the tonsil out and a pair of scissors to cut it out. The operation was done in a minute and the hemorrhage was practically nil. The main danger is from the anesthetic; chloroform under twelve years of age, and gas after that. But anesthetics differ largely wherever you go, and I had hoped to hear some of the gentlemen I have heard today say something about that part of the operation.

DR. EUGENE S. STROUT, Minneapolis :—I want to speak about the position of the patient when operating under general anesthesia. I think Dr. Todd was the first one in Minneapolis to use the method of having the patient lie flat on the table with the head hanging down at a right angle to the body and supported by a nurse seated on a low stool, the operator seated on a chair facing the patient. I operate either with daylight or reflected light, and have no trouble in training the assistant to do the sponging and hold the tongue. In that way the blood bothers you very little. As to the control of hemorrhage, I believe the only surgical method to control it is with a ligature as anywhere else. After using the Tydings' tonsil snare I make firm pressure on the tonsil wound with a large gauze sponge, and if there is any spurting of blood, tie the vessel. I sometimes, in case of hemorrhage, put a deep suture of catgut through the base of the tonsil wound, which does not produce adhesions between the pillars. I also want to mention one of the criticisms about the snare being too large and too much in the way. I don't find it in the way at all, and don't see how it can be reduced in size without having an instrument that is liable to break.

DR. OLIVER TYDINGS (closing) :—The first thing I will discuss are Doctors Beck's, Robertson's and Ballenger's remarks on hemorrhage. I say to you, gentlemen, that I do one-third of the nose and throat work at the Chicago Ear, Nose and Throat College, and that such an amount as a quart of blood, in my experience, or as much as eight ounces of blood, I have never seen. I commenced to use the cautery years ago, and what set me to thinking about this bloodless method was the suffering in my wife's case. She remained in bed two weeks after the first

tonsil was removed; after the second, she staid three days. The throat and pillars are just as pretty work as anyone could possibly wish to see by any method, yet at the same time the pain afterwards was so severe, no man, in operating, it seems to me, with the cautery, would think of doing more than one tonsillectomy at a time. I always remove both tonsils at the same sitting with the snare. I have never had but six cases of hemorrhage reported to me. I have seen three of them. The hemorrhage had been arrested in each instance before I got there. I didn't do a thing. As to the use of adrenalin, gentlemen, it seems passing strange that in the years I have removed tonsils, and I haven't removed a tonsil by this method without it, that I haven't had the severe hemorrhages you have met with, if adrenalin was responsible for it. I had a case reported to me by Dr. Kinsman of Columbus, of a supposed fatality resulting from adrenalin chloride. I wrote to Parke, Davis & Co. but their reply was not satisfactory. I injected an ounce into a dog weighing about fifteen pounds, and he was ready for his breakfast the next morning. I think with the application of 20 per cent cocaine solution and the injection referred to you can produce anesthesia enough to do all the cutting and dissecting necessary, and you can remove any kind of tonsil.

I brought a tonsil with me, that of a physician which had been removed first by snare; then it had been cauterized, and I suppose his confreres did the best they could. When he came to me he had a suppurating cavity; there was nothing showing but a little hole through which the pus was flowing. In order to get into that space I stuck my knife in and split it up, and those of you who are in favor of scraping out tonsils I brought this to show; it had been most thoroughly scraped out, yet it was a suppurating cavity.

Now with regard to the finger. I confess that I am prejudiced, but it is a prejudice without experience, and I think Dr. Gleason's point that it would be dangerous to a finger is true. I have seen two or three cases of specific infection as the result of mouth work by doctors in the last three or four years. I wouldn't care to put my finger in the mouth or throat of a good many people.

I thoroughly agree with Dr. Ballenger that blunt dissecting of the tonsils is not commendable. The instrument I have here has a sharp cutting edge, but is blunt on the point. It has been a very satisfactory one.

ORIGINAL PAPERS

OPHTHALMOLOGIC SECTION

TOXIC AMBLYOPIA OF DIABETIC ORIGIN OCCURRING IN A YOUNG WOMAN.

A Rare Symptom of the Toxemia of Diabetes.

WENDELL REBER, M.D.

Professor of Diseases of the Eye in the Medical Department of Temple
University.

PHILADELPHIA, PA.

It is altogether likely that diabetes is more prone than any other dyscrasia to eventually reveal its toxic phases by all manner of obscure ocular symptoms. Prominent among these are cataract, ocular palsies, limitation of the power of accommodation, pseudomyopia, and retinitis. Less frequent are keratitis, iritis, choked disc, and neuroretinitis. Among the rarest manifestations are acquired hypermetropia, mentioned by Horner, and central toxic amblyopia. The latter condition is the one to which attention is herein directed. Quite a number of cases put down in the literature as instances of diabetic toxic amblyopia have occurred in smokers, and much controversy has arisen as to whether such cases owed their central amblyopia to the nicotine poisoning or to the diabetic toxemia itself. That diabetics show a lessened resistance to the poisonous action of nicotine is a proposition that is more and more accepted by the ophthalmic profession every day. A most conclusive case in point is mentioned by Holmes Spicer (Posey & Wright, p. 458). A man aged 54, had been known to have diabetes for at least two years. About 4 months before he was first seen he had retired from active work, and time being heavy on his hands—he had taken to smoking for the first time in his life. He had smoked very moderately—not more than one pipe a day—and his sight began to fail about three months after beginning to smoke and about one month before he was seen. His sight at that time was R 6/60, L 6/60, he had a central color scotoma, no peripheral contraction of the fields, and his optic discs were rather pale. He at once discontinued tobacco, but his sight continued to fail, and two months later was reduced to 2/60 in each eye.

In all the earlier reported cases, the condition is described as amblyopia without discoverable ophthalmoscopic changes. More recent writers, however, claimed to find changes, as for instance, Schmidt-Rimpler, who affirms—"that the optic nerve head shows slight but undoubted pathologic changes oftener than is generally believed." Among these he notes hyperemia of the disc, but in the larger number pallor of the temporal half of the nerve head and "some little connective tissue disturbance on its surface." Just what picture Schmidt-Rimpler wishes to convey by this last descriptive phrase it is difficult to understand or imagine.

Amblyopia of the character above described occurs in diabetics of fair as well as in those of very poor health. J. B. Lawford, pronounced it rare in patients under 30, and notes that in most published cases the age was over 40.

Necessarily such cases simulate very closely the well known forms of toxic amblyopia due to alcohol and tobacco. In both there is subnormal vision—in both a relative blind spot in the center of the visual field—and in both it is practically impossible to detect any ophthalmoscopic changes in the optic nerve or retina, Schmidt-Rimpler, to the contrary, notwithstanding. It was about 1879 that Galezowski (*Rec. d'Ophthal.*, 1879) first drew attention to these almost parallel conditions and insisted that they were of different origin. Ever since that time a goodly number of instances have been recorded in which it could not be definitely decided whether the glycosuria or the tobacco-alcohol element was the determining factor. Within the past four years the writer has studied five cases, four of which fall into this doubtful class. They were all men and all fairly free smokers. One was 29, one 32, one 47, and one 56. The 29 year old one smoked a great deal but had never drank at all. He averaged about $2\frac{1}{2}$ per cent sugar and frequently showed acetone. His vision never rose above 5/15. The 32 year old man smoked and drank freely. He averaged about $1\frac{1}{2}$ per cent of sugar and showed acetone once. His vision was $2\frac{1}{2}$ /60 each eye, when I first saw him, and after two months' treatment had risen slowly to 5/45. He was a carpet printer and stated that he had worked all day for years in a room filled with dust that was laden with anilin-dyed particles of wool and cotton. It is not surprising that with a glycosuria-toxemia plus a tobacco-alcohol toxemia plus a possible anilin-toxemia, he should develop a chronic low grade retrobulbar neuritis. This was the only one of these four cases that exhibited optic nerve changes discernable with the ophthalmoscope.

The 47 year old smoked excessively and drank beer only occasionally. His vision was R. 5/45, L. 5/20. He averaged about $\frac{1}{2}$ per cent of sugar, but at no time was acetone in evidence. His urea ran about 9 per cent. All the three preceding cases exhibited relative central or paracentral scotoma.

The 56 year old was a champagne salesman who smoked villainously. His vision was 5/22 and 5/15, and his sight had been failing for 7 months. He averaged about 3 per cent sugar—showed no acetone. There was an absolute scotoma in each eye. Under treatment his vision rose to 5/7½ in each eye. Later he contracted pneumonia and drifted into a tubercular condition from which he finally died. All of these four cases were diabetics who presented a toxic amblyopia as one of their symptoms—but in as much as all of them smoked, the writer does not feel that their optic nerve condition could be properly put down as due purely and simply to the glycosuria. (In all of them tabes was excluded).

Leber (Graefe Saemisch Handbuch, 1st Ed.), who has written exhaustively on this subject, believes that the existence of diabetes renders the individual more susceptible to the toxic effect of tobacco than he would otherwise be. This point of view is much strengthened by Holmes Spicer's case, which has been related. So that it is quite possible that there is a class of mixed cases standing midway between the toxic amblyopia, plainly due to tobacco-alcohol poisoning, and those due to the toxemia of diabetes. If so, the four cases just related would naturally fall into that class.

But the evidence is slowly accumulating that central amblyopia may be induced by diabetes without the aid of tobacco or any other extraneous poison. In support of this contention the following case history is submitted:

Miss B. A., aged 29, accountant, came under my observation Oct. 13, 1907, stating that her eyes were bothering her a great deal at night in any reading or sewing. Her physician had previously informed me that she was the subject of glycosuria which had first been recognized about six months previously. When he first detected the condition the specific gravity was 10.36, and there was a slight albuminuria at the same time. Under treatment, however, the albumen disappeared and the sugar was remarkably reduced, remaining somewhere near 1 to 1½ per cent. The conjunctival, corneal and lid sensibility were all normal. Indeed, there was no evidence whatever of hysteria or of any organic nerve disorder. At the time I first saw her, she was wear-

ing R. E. minus 0.25 sph. plus 0.50 cyl. axis 30 degrees. L. E. minus 0.37 sph. plus 0.75 cyl. axis 135 degrees, which had been ordered for her by a competent ophthalmologist three years previously. With these her vision was 5/9 in either eye. Her accommodative power was normal in each eye; likewise her muscle balance. Both eyes showed a low grade marginal blepharitis. Save for this, both anterior ocular segments were normal. The keratometer indicated in the right eye $\frac{1}{4}$ diopter of astigmatism against the rule axis 90 or 180 degrees—and in the left eye $\frac{3}{4}$ diopter astigmatism, astigmatism against the rule, axis 60 degrees or 150 degrees. With the ophthalmoscope both eyes showed an absolutely normal eye ground with the possible exception of a slight hyperemia of the nerve head and a doubtful overfullness of the lymph sheaths, such as is often seen in eye strain. When I attempted to measure her eyes under a mydriatic I found it impossible to give her better vision than 5/9 or normal in either eye. Suspecting I had overlooked some fine macular changes in ophthalmoscopying her without a mydriatic, I again went over both eye grounds in a painstaking manner, but could find no abnormality whatever. The mydriatic was continued for two days and another refraction done at the end of that time, when again it was impossible to give her any better vision than 5/9 in each eye. This second result was, R. plus 0.50 sph. plus 0.37 cyl. axis 30 degrees. L. plus 0.75 sph. plus 0.62 cyl. axis 150 degrees.

The question then rose in my mind as to whether she was not the subject of a toxic amblyopia. Accordingly, when the mydriatic had worked out of her eyes, careful perimetric tests were made of both visual fields, and it was found that for a 5 mm. red object there was a rather indefinite relative blind spot in the center of each visual field, and with a $2\frac{1}{2}$ mm. red object a quite definite one reaching out about 7 degrees toward the normal blind spot in each eye. This accounted for her lowered central vision during the refractive estimate.

This case has been closely studied for the past two years, and at no time has there been complete disappearance of the scotoma in either eye. The latest charting of the visual field done in June last (1909) is shown in Figs. 1 and 2, in which the scotoma estimated with a 2 mm. red object, is pericentral and extends irregularly from 2 to 5 degrees about the fixation point. Her best corrected vision is 5/9 in either eye at the present writing. Both eye grounds continue normal with the ophthalmoscope. The findings in the urine remain about the same as they were two years ago.

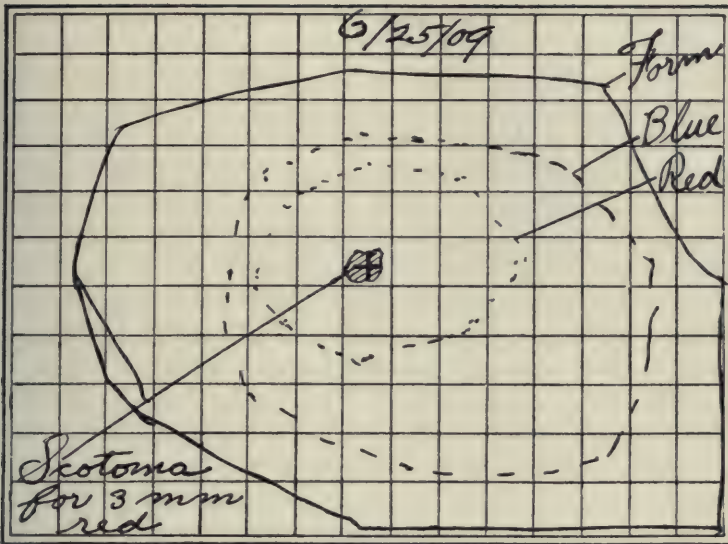


Fig. 1.

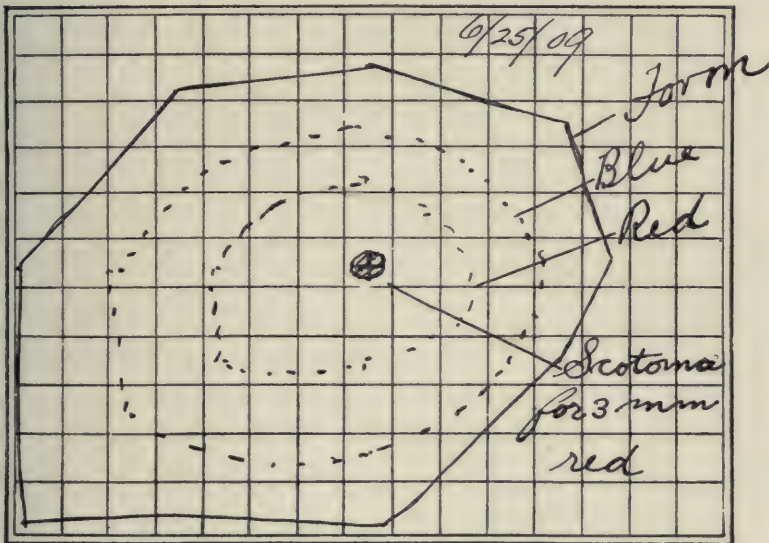


Fig. 2.

Nettleship reports a case of central amblyopia occurring in a 30 year old woman of thin habit and poor health. The diabetes had been of about seven months' duration. The vision in each eye was 6/6 poor. She could not read the smallest print easily with any lens. There was a small central scotoma for red and green,

but no limitation in the field of vision. No change whatever could be found with the ophthalmoscope.

In 1882 Samuel reported a case (from Hirschberg's clinic) occurring in a 52 year old female, in whom iridectomy had been performed for pupillary occlusion following an iritis. The fields of vision are stated to have been almost full, but there was a central scotoma in evidence in each eye. Vision equalled 15/200, and with plus 5.00D the patient could read Snellen 13. The urine contained 4.5 per cent of sugar, the general symptoms of diabetes were slight and the patient's health was but little impaired.

Moore records two cases as follows: Case 1. Female, 49 years of age, with a history of diabetes for six months. Rapid failure of vision for one week before coming under observation. Much sugar in the urine. Vision in each eye 20/200, no limitation of field but a large scotoma for red and green. No ophthalmoscopic changes except doubtful pallor of temporal half of disc. Vision remained stationary. Patient died two years later. No autopsy.

Case 2. A 51 year old female, with diabetes for some months. Sugar abundant. Vision failed first in the right eye; at time of observation 20/50 in each eye, not improved by glasses. No abnormality in the fundi except a slight dusky hue. No contraction of the fields, large central scotoma for green, relative for red. Six months later vision equalled 20/200 in each eye. Patient died of gangrene of the foot one year after she was first seen by Moore. No autopsy.

These five cases (including my own) all occurred in women, so that tobacco as a factor may be excluded.

In several instances the optic nerve of patients dying of diabetes (who during life showed central amblyopia) have been examined under the microscope, notably by Nettleship and Edmunds, Edmunds and Lawford, Fraser and Bruce, and Schmidt-Rimpler. The condition found is one of degeneration of those fibres in the optic nerve known as the "papillo-macular bundle."

Uhthoff, in his presentation of the subject before the 13th International Congress in Paris, held that inflammatory symptoms in the papilla are slight and seldom produce anything more than a trifling atrophic discoloration of the temporal portion of the nerve head. Alterations in the retinal vessels he pronounces rare, also perineuritic changes. In this group of cases alcohol and tobacco hold etiologically the first place; then come carbon bisulphid, arsenic, iodoform, stramonium and hashhish. He asserts that it is justifiable to associate with these causative factors those affections whose anatomic lesions are not yet determined but whose

symptoms parallel very closely those of alcohol and tobacco amblyopia. Most prominent among these he places saccharine diabetes.

Fraser and Bruce's case is of more than usual interest, in that the patient suffered from symptoms indicative of peripheral neuritis and that degenerative changes were present in the spinal nerves similar to those in the optic nerve. This patient had been a heavy smoker but temperate in the use of alcohol. All the cases examined microscopically had defective central vision during life and all were smokers, except Schmidt-Rimpler's patient. His case, in its clinical features and microscopic findings, appears to coincide exactly with the other three that were examined microscopically; and as tobacco and alcohol could be almost certainly excluded in this case there seems to be reasonable ground for believing that diabetes may lead to an axial neuritis or degeneration similar in its microscopic features to that induced by such toxemias as tobacco and alcohol.

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DISCUSSION.

DR. FERNANDEZ, Havana, Cuba:—Very seldom have I observed the ocular manifestation of diabetes without evident changes in the fundus. When, however, I have observed no changes in the fundus and the amblyopia could have been mistaken for that produced by alcohol or tobacco, the slight nyctalopia which is observed in the alcoholic and nicotine amblyopia have been absent in the diabetic. Sometimes I have attributed symptoms of the fundus to what corresponded to the diabetic

cataract, and which appear in the form of slight astigmatisms of so short duration that the patient is obliged to change glasses several times in the course of a very few days. When I speak of the diabetic cataract I cannot refrain from saying that the results are most successful if it is conveniently operated upon and there is no need of having any fright.

DR. F. PARK LEWIS, Buffalo, N. Y.:—I have just one word to say in regard to the reversal of the suggestion which Dr. Reber has made. He calls attention to the fact that diabetics are peculiarly susceptible to the action of tobacco, and I think we will find sometimes that an exaggerated susceptibility to tobacco may be an indication of the existence of an overlooked scotoma. The eye condition may not be prominent, the chief noticeable condition of change in the patient being the susceptibility in those who have heretofore been able to use tobacco in any form. We may to advantage examine the urine and find we have a diabetic.

DR. JOHN E. WEEKS, New York:—It has been my custom for a number of years to have the urine carefully examined in cases of central scotoma. I have not, with the exception of one case, found a condition of glycosuria. I find it requires from fifteen to thirty-five years for one who uses tobacco to produce central scotoma.

DR. HENRY B. YOUNG, Burlington, Iowa:—Diabetic amblyopia must be very rare. In a paper presented by me over eleven years ago to the Ophthalmic Section of the American Medical Association, one of the first on auto intoxication amblyopia in this country, I reported a series of cases, and in none was there any diabetic amblyopia. There is no reason why we should not have an auto intoxication amblyopia of a systemic disease like diabetes; but one feature of the subject which the essayist did not refer to has been to me a characteristic one in suspecting glycosuria, and that is the undilatability of the pupil. I had one patient with that one symptom alone to go on, and I had the urinalysis in the presence of the family physician, who laughed when he saw a specific gravity of 1017. He said, "You are off the track." Repeated tests showed the proper reaction in every instance. I have seen in a practice of nearly thirty years I think the average of diabetic patients, and I do not recollect a single one who had this peculiar form of loss of vision. I have seen all the other peculiarities connected with glycosuria. But, this undilatability of the pupil is always a suspicious symptom.

DOUBLE PARALYSIS OF THE MOTOR OCULI.

THEODORE SCHNEIDEMAN, A.M., M.D.

Professor of Ophthalmology, Philadelphia Polyclinic.

PHILADELPHIA.

R. R., female, aged 17 years; father died of consumption, mother healthy, the fifth of eight children, all living and healthy except one, which died as the result of an injury. Had measles, chicken pox and whooping cough in childhood, otherwise nothing of special note until the present illness.

The middle of December, 1908, experienced some difficulty in keeping the right eye open. The lid continued to droop more and more. About a week later, after the beginning of this difficulty, the girl began to have double vision. The left eye, although similarly affected in a milder degree, was believed by the mother to be healthy until attention was called to it by me when first seen, February 14, 1909. At that time there was incomplete ptosis of both eyes; the right upper lid could not be raised so as to expose more than the lower half of the cornea, while the lower three-fourths of that membrane could be exposed in the left eye. Both eyes were in moderate divergence, the right more so than the left. Each eye could be brought to the middle line, but not beyond; movements of sursumduction and supraduction were greatly impaired, being limited to 10 degrees; upon looking downward each eye diverged markedly, due no doubt to contraction of the superior oblique. Crossed diplopia was present, but the exact study of the double images was unsatisfactory on account of the stupidity of the girl and also from their extreme separation, which made the simultaneous view and judgment of their position very difficult. The image of each eye could be clearly seen when the other was excluded, but when the attention was directed to one the other would fade. A study of the movements of each eye clearly showed that the muscles innervated by the third nerve were all parietic, though there was no complete paralysis of any, while the abducens and superior oblique were evidently functioning. The patient was placed upon iodide in increasing doses, but there did not appear to be any improvement. The internal musculature was intact, as shown by the condition of the pupil and the accommodation. The girl was under observation two months when she was lost sight of. The mother informed me subsequently that the girl died June 17, after an illness of two weeks, from what the physician in attendance pronounced "inflammation of the brain."

From the meager account that I could gather, the illness was ushered in by violent headache. The patient was unconscious part of the time and was unable to articulate; the mother volunteered the opinion that the latter was due to inability to move the tongue, which seemed to be "paralyzed," as she put it. She also stated that there were no palsies of other muscles apparent, and that the ocular conditions remained unchanged until death.

The interest in this case attached principally to the etiology of the ocular affection. What was the pathological nature of the lesion, and where was its seat? It appears beyond doubt that the fatal illness, evidently a cerebral affection, must have been connected with the preceding pareses of the ocular muscles. In view of the meager data obtainable regarding that illness it is impossible to arrive at a conclusion based upon the symptoms thereof as to its exact nature, but some variety of meningitis of the base may have been the final chapter in a process which showed itself first in paresis of the ocular muscles.

Of the anatomical seat of the lesion causing ocular paralyses, central nuclear, and fascicular, intermediate and peripheral, it is difficult in many instances to determine the exact location. In the case here reported a central origin seems the only one admissible. The absence of involvement of other nerves and the occurrence on both sides strongly point to a nuclear lesion. The pathological diagnosis is frequently syphilis. Authorities are pretty well agreed that this is the cause of 50 per cent to 75 per cent of all cases; and of these paralyses the third and sixth nerves are the most frequently affected. The fatal termination accords well with this view. For a meningeal involvement is often present. But even if we are forced to admit the connection between syphilis and these palsies we do not know why the syphilitic poison should more frequently affect the nerves of the eye than the other cranial nerves. But as How states in his treatise, such classifications, while good as far as they go, are little more than a name, and one case often bears no relation to another similarly classified. As a matter of fact, Uhthoff has found that in a certain number of cases of undoubted syphilis, that the third nerve was affected on one or both sides in about 30 per cent. The anatomic changes varied, though most were accompanied by inflammatory changes in the nerve or meninges, either with or without gumma.

Tubercle, as we know, may also be a cause of ocular paralyses, and this may have been present in this case. If the opportunity of further study had been presented the proper examination and tests for that condition would have been instituted.

Palsies affecting some of the muscles of both eyes, while they can not be called clinical curiosities, are uncommon; their etiology is often very obscure, though it is this that gives them their interest.

One variety has been described under the title myasthenia and ophthalmoplegia. Gowers calls it a "mysterious malady." He states that it is not even known to name by many members of the profession. In this affection there seems to be no palsy but a general weakening of several of the ocular and other muscles of the face. The light reflex of the iris is perfect, though the accommodation seems to have been involved in some of the recorded cases. The symptoms have been ascribed to some toxic agent, but with little reason. It seems at present impossible to go beyond imperfection of the nutrition, which may, perhaps, be brought about by many causes.

In spite of the inadequate history of the last illness, it seems justifiable to conclude that it was a meningitis, and most likely tubercular. As it seems impossible to doubt that there was a connection between the preceding palsies and this illness, may we not assume that the pathological cause of the former was tubercular. The absence of all indications of syphilis and the utter failure to respond to specific treatment would justify the exclusion of the latter as the cause of the ocular affection.

DISCUSSION.

DR. HOWARD F. HANSELL, Philadelphia:—I discovered accidentally in looking over the program that I was down for this discussion and have made no preparation. I have been interested in the description of the case for several reasons. As to the diagnosis, there can be but one opinion, namely, a slowly advancing paralysis of the third nerve. The paralysis is not total as yet, since the internal ocular muscles are not involved. The etiology is uncertain. Direct pressure upon the third nerve must have produced paralysis of all the muscles supplied by that nerve.

I saw a patient a few days ago, operated on for decompression, which reminds me of Dr. Schneideman's case. She had total loss of vision coming on in the last few weeks, due to atrophy of both optic nerves. The diagnosis made was tumor of the occipital lobe. The post mortem showed large cysts in the cerebrum and two or three smaller ones pressing on the optic nerve. No constitutional cause can be assigned. The etiology seems to be, as Dr. Schneideman has said, tubercular meningitis, or tubercular infiltration of both the meninges and the brain substance itself. The tubercular tests, including that of the blood, as described by Dr. Rosenberger, might be useful.

DR. EDWARD JACKSON, Denver, Colo.:—Dr. Schneideman's case recalls to me one that I saw with the late J. T. Eskridge, in which the early course was that of progressive bulbar palsy. Both third nerves were involved, and there was some disturbance of swallowing. After a few weeks the process ceased to progress. There was distinct improvement in the power of the ocular muscles. Both intra and extra ocular muscles

were involved. It was a severe paresis, not paralysis. Marked improvement occurred in three months. The patient lived about two years, and then died with apparently a renewal of the same process. I think in that case the patient was a man between thirty-five and forty, unquestionably syphilis was present. The case was similar to the one reported today, except this long interval of incomplete recovery before the termination.

DR. G. C. SAVAGE, Nashville, Tenn.:—I am sorry that Dr. Schneideman did not give us more data in connection with the case. Was there any trouble in right and left version?

DR. SCHNEIDEMAN:—I think not.

DR. SAVAGE:—I do not think the case was basal. I do not think the nerves were involved. I think the case was cortical. Let us take it for granted the patient was right-handed.

THE CHAIR:—That is going into theories, and we have not time.

DR. SAVAGE:—I am going to discuss the case. My impression is that your case was cortical and located in the motor area in the left side of the brain. In the first place, there is a center for elevating both eyes, also a center for depressing, both of which must be involved. There is a center for acting on the inferior obliques, and that center must also be involved. There is also a convergence center and a center for the right version of the two eyes, and one of these was certainly involved, and probably the other. Left version should not have been impaired, for its center is in the right cortex. The centers mentioned, except that for left version, may be close together, and therefore easily involved, even in slight cortex pathology; but the center for the ciliary muscle may be so far removed as not to be involved. All of these, except the center for right and left version, have fibers in both third nerves. The fibers controlling accommodation are not involved, but if the nerves themselves were involved, they would be. Later the disease extended so as to involve the speech center, as I understood.

DR. SCHNEIDEMAN (closing):—If I had suspected that this case would pass out of my observation so soon or have a fatal termination, examination for tuberculosis would have been made.

SOME CLINICAL OBSERVATIONS UPON SYMPATHETIC OPHTHALMITIS.*

DUNBAR ROY, M.D.

ATLANTA, GA.

The question of the pathology and general management of sympathetic inflammation as well as sympathetic irritation, has not yet been decided. This paper is in no wise a résumé of the subject, but it is for the purpose of reporting two cases; to discuss succinctly certain phases of the treatment and to show the micro-pathological specimens of the same. Certain phases of this subject have recently impressed themselves upon my mind from clinical observation, and it is just two points I wish to discuss.

1. Is there any benefit to come from the enucleation of a primarily affected or injured eye after a fully developed inflammation (plastic iridocyclochoroiditis) in the fellow eye?

2. Are we warranted in trying to save an imperfect or badly damaged eye, and thereby jeopardizing a perfectly good one? In other words, is it better to have one perfectly good eye the remainder of life, or to have two defective organs of vision?

In regard to the first proposition, I think that most ophthalmologists are agreed, and the two cases here reported certainly substantiate in a measure the correctness of this opinion.

In consulting reference on this point, I find that ophthalmologists are almost universally agreed that if there is an active, sympathetic inflammation in the uninjured eye, the removal of the injured member in no wise retards the inflammatory process, and in many cases it is better to try and save some vision in the offending eye.

Case 1. Lucy T., aged eighteen. In January, 1903, patient accidentally struck the left eye with a piece of glass. There was a rupture of the cornea at the inner inferior quadrant with prolapse of the iris, and very little irritation when seen the next day.

*The title and contents of this paper were suggested to me by hearing the paper of Dr. Donovan of Butte, Mont., read before the Section of Ophthalmology at the meeting of the A. M. A. in 1903, where he made a plea for the injured eye, not to enucleate until every effort had been made to save the same. Such ideas as embodied in that paper I consider as erroneous teaching and certainly they do not coincide with my clinical experience. I believe in trying to save every injured eye, but to teach that one should wait until the very last moment before enucleation, would put back fifty years the practice of Ophthalmology. It is a good deal better to teach the general practitioner and the inexperienced ophthalmologist that it is best to enucleate in every severe lacerated injury of the eyeball than to teach him to treat the case expectantly and watch for sympathetic inflammation.

The iris was abscised, atropia and compress bandage applied. The eye healed with very little pain and irritation, and leaving a very small corneal cicatrix. Some opacity of the lens developed, but this remained stationary and the patient was able to see large objects. In April the patient presented herself again with some pain and ciliary congestion in the good eye. The injured eye was absolutely free from irritation. Atropine revealed a plastic irido-choroiditis with deposits on the lens and in the vitreous. Vision was reduced to perception of light, so hazy had the vitreous become. Enucleation was not done because it looked then as if the vision in the injured eye could be made to improve more than that in the sympathetic eye. Drastic treatment was instituted by giving large doses of the iodides internally, subconjunctival injections of mercury, and the normal salt solutions, the local application of dionin and atropine solutions, together with active diaphoresis. Under this treatment the eye improved, and today the patient has a vision of 20/70 and the injured eye remains the same.

A short time before this case appeared, I read an article by Prof. Laquer of Strassburg, who reported several cases of sympathetic inflammation practically cured by large doses of mercury and the iodides. This writer was very sanguine as to the ultimate result in all cases of sympathetic trouble, should this line of treatment be pursued.

Some two years later the following case came under my care: L. C., two and a half years old, was brought to my office on February 10, 1905, with the following history: About the middle of last December the child was playing with a stick when he accidentally struck it into the right eye. This later became considerably inflamed, but seemed to get well under home treatment as far as they knew. About February 1 the good eye became inflamed, and noticing that the child could scarcely see, they brought him in for treatment. The left eye showed a marked plastic irido-choroiditis with inability to dilate the pupil with atropine. The vitreous was very hazy and the fundus could scarcely be seen. The injured eye was atrophic and tender, with a deep linear scar in the cornea. Enucleation was immediately done and active treatment instituted in the sympathizing eye. There was some improvement so that the child could see a pin on the floor. However, the vision grew worse again, although active treatment was continued, and now the child is practically blind.

Case 3. N. F., male, age fifteen. On August 20, 1907, while using a hammer a piece flew off and struck the right eye. I saw

the patient the next day and found the following: Patient suffering no pain and practically no irritation about the eye. There was a rupture in the upper part of the cornea with protrusion of the iris. The eye was cocaineized and the protruding iris removed. The giant magnet was tried several times without result and without any signs of a foreign body being present. The patient's father was sure that no piece of steel went into the eye. Atropine and compress bandage was applied. The pupil dilated nicely and the eye healed without almost any pain. There never were

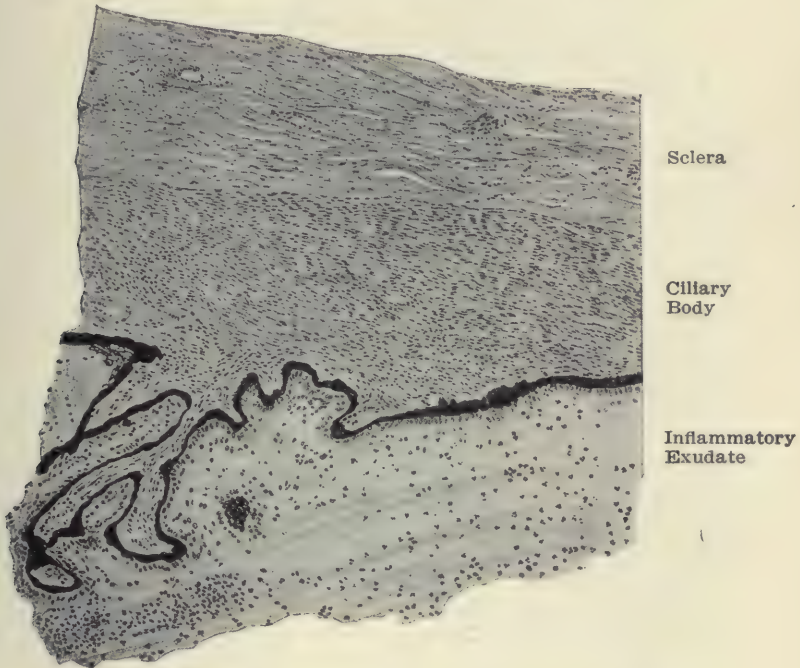


Fig. 1.—Case of nonsympathetic endophthalmitis. The inflammatory products are dominated by the polymorphonuclear leucocyte and appear outside the ciliary body. Low magnification.

the slightest signs of irritation in the good eye. A partial traumatic cataract developed. The patient was dismissed about the middle of September with instructions to return immediately should either eye show the slightest signs of irritation. On October 7 the patient returned saying that his good eye had been paining him for three days. Examination showed a circumcorneal injection. Atropine was used and a plastic iritis and irido-choroiditis with deposits on Descemet's membrane and opacities in the vitreous disclosed. I decided not to enucleate the injured

eye, as the inflammation in the good eye was so far advanced. The injured eye was perfectly quiet. The patient was placed upon a strong solution of atropine locally and large doses of iodide of potassium and mercury internally. The next day the pupil was about two-thirds dilated, the irritation less, but marked deposits on the inner surface of the cornea and in the vitreous. Vision barely equaled fingers at one foot. October 9 all symptoms improved. Vision 20/200 and with a plus three dioptré, 20/50. From this time on the eye improved and all symptoms of irritation subsided. In one week's time the patient was allowed to return home and the same treatment continued.

On November 29 the patient returned with the injured eye again inflamed and the uninjured eye the same as when last seen. On account of the pain and the idea that possibly this eye was still causing some irritation in the better eye, it was immediately enucleated and a portion of the optic nerve resected. Healing was prompt and at the end of the week he returned home with absolutely no irritation in the remaining eye. Three weeks later the patient again appeared with considerable irritation in the left eye, in fact a renewed attack of irido-choroiditis. This subsided under the use of atropine, hot fomentations and the alteratives internally. Strange to say, as the result of the last attack of inflammation the deposits on the cornea and in the vitreous became less. The fundus could be very much better seen. Vision equaled 20/100 and with correction 20/20. There has been no further trouble and vision remains the same.

Was this betterment the result of the mercury and iodide internally, or due to the enucleation?

In the first case, which was not operated on, the result was better than in the second, while as compared with Case 3, this latter seemed to have the better of the argument as to the final result, although there was an acute attack after the enucleation had been done. Ophthalmologists are still not unanimous on this point and I must say that I am undecided in my own mind. If enucleation of an eye which has only the future possibility of some vision, will be of material aid in improving the already existing vision of the sympathizing eye, we should certainly advocate the operation. The second proposition is this: Are not ophthalmologists leaning too far toward conservatism in their efforts to save an injured eye, with a possibility at any time of having two defective eyes? Until our knowledge is more definite as to the etiology and pathology of sympathetic inflammation, we can never be certain but that an injured eye will be followed by an inflammation

in the other. It is true that since the introduction of more thorough asepsis, the number of cases of sympathetic trouble may have decreased, and yet when injuries do occur, we are far from being able to say that no micro-organism has entered the eye. I believe that ophthalmologists, in their efforts to save an injured eye, take frequently too great a risk.

I believe that the rules for enucleation as laid down by Swanzy, and quoted in so many text-books, are as applicable today as when

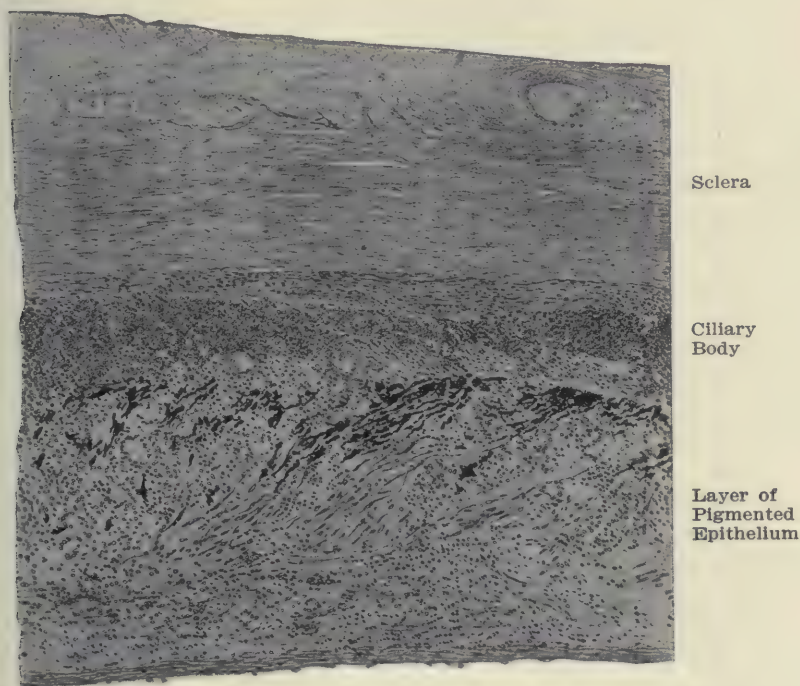


Fig. 2.—Deposit, characteristic of sympathetic ophthalmitis, situated *within* the ciliary body. It has burst through the pigment epithellum and formed an exuberant mass within the eye. The normal structure of the ciliary body has been *replaced* by a new formation consisting of lymphocytes, a few giant cells and epitheloid cells. The latter form a layer in the ciliary body adjacent to the pigmented epithellum. Low magnification.

they were first written. The almost universal use of the electro-magnet for the extraction of foreign bodies has also made us bolder, and where we see so many cases reported where not only the eye itself, but also the vision is preserved, we are still more reluctant about enucleating this class of injured eyes. De Schweinitz, no doubt, expresses the views of most ophthalmologists of the present when he says: "It is universally conceded that the enucleation of an eye (preventive enucleation) primarily

injured, the visual function of which cannot be restored, is the surest way of preventing sympathetic ophthalmitis." All perforating injuries to the eye, it matters not how trivial they seem, where the healing process leaves some portion of an incarcerated iris, put me in a state of mental fear for the future safety of the other eye. In these injuries, even where we may expect a partial restoration of vision, and where the patient lives at some distance from the care of a competent oculist, I believe it to be better to enucleate immediately. It is much better to be almost positively sure of one good eye than to run the risk of having two defective eyes. It is true that enucleation is not always a surety against sympathetic troubles, but cases of sympathetic ophthalmitis, where the injured eye is removed immediately after the accident, must be exceedingly rare. Many brilliant results have been reported from the use of the electro-magnet, but it is also true that many of these cases have not been followed for long periods of time, and therefore the final outcome has not always been ascertained. A case recently under my observation bears on this point. K. J. L., male, age twenty-three, while hammering a piece of iron felt a piece strike his eye. There was immediate pain and loss of vision. I saw him three hours later on the same day, June 19, 1907. Examination showed a triangular rupture of the cornea on the nasal side. Iris not prolapsed but caught in the wound. Posterior chamber filled with blood. No fundus reflex. Atropine produced only moderate dilatation of the pupil. Giant magnet used and the piece of steel extracted without difficulty. Eye treated with atropine and compress bandage. Healing took place with very little irritation and pain. Traumatic cataract developed and the iris remained adherent to the wound. Patient returned to work on September 1, three months after the injury. On October 26 he presented himself again at the office because of having been struck in the injured eye by a hot cinder. An abrasion was found at the sclero-corneal margin close to the old wound. Such severe pain and irritation developed, and with marked sympathetic irritation in the good eye, that on November 9 the eye was removed. All irritative symptoms subsided and there has been no further trouble.

In this case the eye healed perfectly, with every indication of a brilliant result, but with a slight superficial injury, two months later a violent inflammation was produced, which required enucleation, because of decided irritation in the good eye. The result of this case was fortunately good, but how easy could it have been otherwise.

The findings of Fuchs in his micro-pathologic examinations for eyes removed for sympathetic ophthalmitis, has certainly opened up a new field for investigation, although it does not seem to be of much practical value as an aid to us in knowing when to enucleate for a possible sympathetic trouble. All are familiar with this work, and it is therefore unnecessary to go into further details. The only possible practical value that such observations can produce, is on the assumption that a certain micro-organism is responsible for these peculiar epithelioid changes; and, if so, the possibility of discovering this organism, and knowing that it pro-

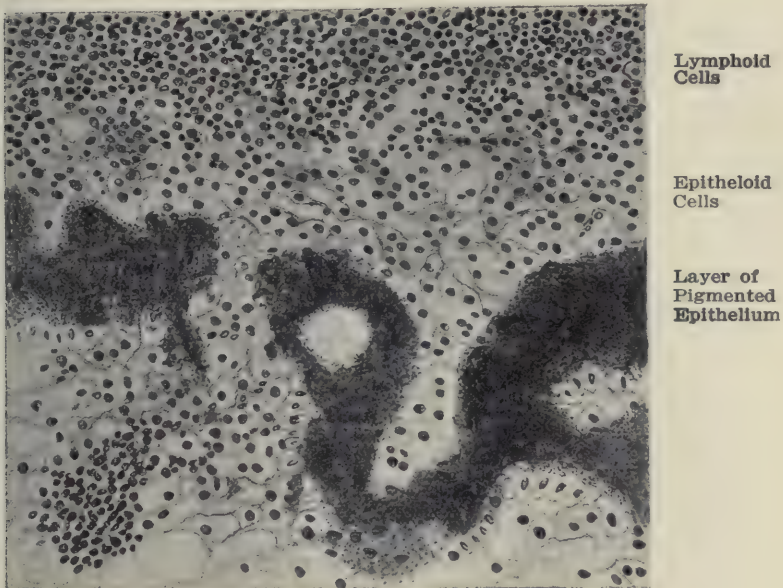


Fig. 3.—Shows details, under high magnification, of the deposit characteristic of sympathetic ophthalmitis. At this point the endothelioid cells and lymphocytes are breaking through the pigment epithelium.

duces certain changes which are associated always with sympathetic ophthalmitis. If we could do this, then we might know when, and when not, to operate.

I take the liberty of showing two sets of slides from specimens sent to Dr. E. L. Oatman, who has kindly written the micro-pathologic report. The first set shows the changes spoken of by Fuchs, and which are from the eye of Case No. 3, removal for sympathetic ophthalmitis. The second are sections from the eye of the last case which was removed for sympathetic irritation, and which, according to Dr. Oatman, do not show the changes.

According to Fuchs' theory it would not have been necessary to remove this eye.

Microscopic Examination of Dr. Dunbar Roy's Cases. By E. L. Oatman, M. D. From the Pathological Laboratory of the Manhattan Ear, Eye and Throat Hospital, New York City.

"Dr. Roy particularly requests me to ascertain if the pathologic changes found in the eye which caused sympathetic irritation differ microscopically from those found in the eye exciting sympathetic inflammation.

Previous to 1905 it was believed that sympathetic and non-sympathetic ophthalmitis possessed a common morbid anatomy. In that year Fuchs published observations and conclusions which, if confirmed by subsequent investigation, constitute a great advance in our knowledge of these conditions. A brief presentation of Fuchs' views render this report more intelligible.

The ordinary exudative or plastic form of iridocyclitis is manifested by infiltration of the tissues with mono and polymorphonuclear leucocytes. The ciliary processes pour out a purulent secretion, rich in albumin and fibrin, which surrounds the lens, appearing in the anterior chamber, and vitreous. The condition of endophthalmitis now exists, in which the tissue may become necrotic and form an abscess (panophthalmitis), or undergo cicatrization and terminate in phthisis bulbi. The early stage of this disease is marked by the preponderance of the polymorphonuclear leucocyte or pus cell. This form of uveitis is not supposed to cause sympathetic inflammation. The pathologic changes which, according to Fuchs, excite sympathetic ophthalmitis, differ essentially from those just described. He says: "In the exciting eye we find the uvea distended with densely crowded, uninuclear leucocytes (lymphocytes). In most cases focal collections of epithelial cells, which not infrequently have giant cells between them, lie in the midst of this uniform infiltration. Nodules are thus produced, which often resemble tubercles. This peculiar infiltration often is present in only a few spots. In other cases the uvea is either largely or wholly occupied by them. Sometimes the infiltration makes its way even into the sclera, which is permeated with scattered nodules. In this way perforation of the sclera and extraocular proliferation may result. "At a later stage the infiltrating cells are replaced by dense connective tissue. The one characteristic feature of this process is the proliferation of epithelioid cells within the uvea."

If these theories are valid, the eyes which I am now examining should show, in the non-sympathetic case, a plastic inflammation, the products of which are found on the surface of the uvea; while in the sympathetic case new cellular formations should be found within the uvea.

Report on case which excited sympathetic irritation only: At the point where the fragment of steel passed through the cornea, the substantia propria and Descemet's membrane is replaced by cicatricial tissue. In this region is an adhesion between the cornea and iris. The cornea now exhibits the phenomena of an acute inflammatory process, which is most marked in and around the old perforation. The cicatrix and surrounding cornea are infiltrated with polymorphonuclear leucocytes, indicating the course of a pathogenic invasion which leads directly inward to the adherent iris.

An acute iridocyclitis is in progress, as manifested by hyperæmia and infiltration of the iris with mono and polymorphonuclear leucocytes. The leucocytes have migrated from the tissues and appeared in the anterior and posterior chamber. The inflammatory process is more intense in the iris than in the ciliary body.

The lens is degenerating, partly absorbed and infiltrated with leucocytes.

The choroid is thickened from hyperdistension of its vessels with blood.

The retina is the seat of chronic proliferative retinitis, attended by increase of neuroglia and formation of membranes around the vessels and upon the retinal surface. This condition is frequently observed after foreign bodies have lodged within the eye. To this chronic disease there is now superadded an inflammatory edema of recent origin. Over the inner surface of the retina are scattered leucocytes and pigmented cells, which have been cast off from the ciliary body.

The fragment of steel, which was removed by magnet, was arrested by the sclera at a point three mm. below, and to the nasal side of the papilla. It passed through the retina and penetrated a large choroidal vessel. The hemorrhage which ensued led to the formation of a dense, funnel-shaped membrane, the apex of which was attached to the point of impact and the base to the ciliary processes. The rent in the retina is filled in with connective tissue.

This distinction is particularly emphasized by Dr. E. V. L. Brown.

The optic papilla is elevated by proliferated neuroglia and edema.

Microscopical examination of this eye reveals neither focal accumulation of lymphocytes nor unusual proliferation of epithelioid cells within the uvea. On the other hand, we find an acute inflammatory process, dominated by polymorphonuclear leucocytes.

The diagnosis is exudative iridocyclitis (incipient endophthalmitis), which, according to Fuchs' theory, does not cause sympathetic ophthalmitis.

Report on the case which excited sympathetic ophthalmitis: The corneal wound, described in the clinical history, is situated about one mm. from the limbus. In none of the sections examined did it extend into the sclera. Descemet's membrane is ruptured and the broken ends rolled inward. The stump left from the amputated iris is incarcerated in the posterior lips of the perforation. The corneal wound is closed by a well knit cicatrix, excepting at one point, where the entire thickness of the cornea is occupied by a cellular deposit, continuous internally with the iris stump, and externally with similar deposits situated in the sclera and episclera. These deposits are made of lymphocytes, with occasional epithelioid cells. Histologically they belong to the granulomata. Many of the anterior ciliary vessels are ensheathed by nodules of lymphocytes. The episcleral tissue is thickened both from lymphoid infiltration and increase in its fibrous connective tissue. This appears to be a sclerosing process which has extended into the periphery of the cornea. From these findings the epibulbar condition should be designated as episcleritis.

The most notable changes are observed in the uveal tract with a lens of low power. The iris and ciliary body are seen to be thickened and nodular, presenting an appearance not unlike that observed in tubercular invasion. This resemblance is enhanced by the entire absence of fibrino-plastic exudation and adhesion. The choroid is irregularly thickened from focal cellular deposits. With a lens of high power the iris is found to be densely infiltrated with lymphocytes. Epithelioid cells are irregularly distributed throughout the infiltration. They occur singly and in groups, particularly around the blood vessels, from the endothelial lining of which they appear to originate. The structure of the iris stroma is greatly altered. Its blood vessels are diminished in number and the stroma cells have lost their pigment. There is a false appearance of plastic inflammation in and around the iris

stump. This, however, is a reparative process, resulting from the original injury. No polymorphonuclear leucocytes are found in the iris or elsewhere in this eye.

The cellular infiltration is less uniform in the ciliary body than in the iris. Just beneath the pigmented epithelium a broad zone of lymphocytes and epithelioid cells extend the entire length of the ciliary body and for a variable distance into the choroid. In the region of the perforation the epithelioid cells are proliferating luxuriantly and have burst through the pigment layer, forming granulomata on the inner surface. The cellular deposits have replaced the stroma of the ciliary process, many of which are filled with epithelioid cells. The musculus is densely infiltrated with lymphocytes and, in the more advanced stages of the process, all trace of original structure has disappeared. Wright's stain demonstrates large numbers of mast cells scattered throughout the iris and ciliary body. Giant cells and fibroblasts are occasionally found in the older layers of proliferation. These cells, however, belong to a later stage, namely, that of connective formation.

The deposits in the choroid are composed of lymphocytes, irregularly distributed in the outer layers.

The vitreous is slightly albuminous. It contains pigmented epithelium, lymphocytes and epithelioid cells which have been cast off from the ciliary body. The retina exhibits an increase in neuroglia and edema. There is moderate lymphoid infiltration around the retinal vessels. The rod and cone layer is granular, but this, probably, is due to imperfect fixation methods. The retina does not participate in the proliferative process present in the uvea, although at the *orra serrata*, granulomata have broken through and destroyed it.

The optic nerve shows proliferation of neuroglia and edema on the papilla. It is not atrophic, as demonstrated by Weigert's stain for medullary sheaths. No micro-organisms were discovered in the tissues.

Microscopic examination of this eye reveals infiltration of the sclera, corneal wound, iris, ciliary body and choroid with lymphocytes and epithelioid cells, with complete absence of exudative inflammation. The diagnosis, therefore, is proliferative uveitis, which, according to Fuchs, constitutes the anatomic condition of the exciting eye in sympathetic ophthalmitis.

These two instructive cases conform, in every particular, with the theory that sympathetic ophthalmitis does not result from an exudative inflammation of the uvea, but from a slow formative process. It is true that the majority of eyes which excite sym-

pathetic ophthalmitis exhibit both exudative and proliferative changes. This is explicable when we consider that most cases follow perforating injury, which may implant a variety of micro-organisms within the eye.

The existence of epithelioid proliferation in the exciting eye was noted long before Fuchs advanced his theory, that epithelioid proliferation is the essential pathologic condition in sympathetic ophthalmitis. In 1895 Hirschberg pointed out that the injured eye contained granulation tissue closely resembling tubercle. This led him to infer that the cause of disease was bacillus, which excited tissue proliferation, not a coccus or pyogenic organism."

The theories presented in this report have been corroborated by many observers; nevertheless they cannot be considered as established.

If the morphology of sympathetic ophthalmitis has been discovered, it should be demonstrated in every case. An apparent exception is described by Fuchs. A young man, nearly three years after perforating injury to the right eye, developed an iridocyclitis in the left eye, characteristic of sympathetic disease. When the right eye was enucleated and examined no proliferative uveitis was found. From the lapse of time between the injury and onset of inflammation in the left eye, it may be argued that the latter occurred independently of the original injury.

If sympathetic ophthalmia depends upon a specific micro-organism, which excites characteristic proliferation of tissue, we should expect the histological changes in the sympathizing eye to correspond with those in the exciting eye. The limited number of cases examined leave this question undecided.

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DISCUSSION.

L. WEBSTER FOX, Philadelphia:—There is no subject in the whole range of ophthalmology that the teachers in medical colleges approach with more fear and trembling. It is our duty to be positive and clear in our instruction on this subject to young students in medicine. We were taught formerly that an injury to the danger zone required an enucleation; that was the only thing to be done. However, science has made advances and operators are more conservative about enucleations. The pendulum is swinging the other way, and I think rightly so. The doctor has described one patient in whom after the enucleation was performed sympathetic irido-cyclitis occurred. We who are in the centers of the manufacturing districts and see a great many injuries to the eye must

use the greatest discretion in operation. An eye is frequently retained or removed as indicated by the line of the injury; that is, a diagonal cut across the ciliary processes is much more dangerous than the cut vertical to the processes. What are we to do with these cases when they come to us? First, make your diagnosis as to the line of incision. If between the processes, put the eye at rest with atropin and cold applications. Then comes a very important procedure. After the wound has filled up with plastic material apply the actual cautery over the wound. Follow this with Gifford's treatment, one grain of salicylate of soda to each pound of the body weight. I believe if we follow this practice in all cases we will find less sympathetic ophthalmia than ever before. It is not necessary to commence with these heroic doses of the salicylate of soda. My method is to commence with hydarg. c. cerate, grain ii, three times daily for four or five days; then begin with the salicylate, say ten grains, three times daily, and rapidly increasing the quantity up to the physiologic limit, as suggested by Dr. Gifford.

DR. D. C. LOUCHERY, Clarksburg, W. Va.:—I merely want to make a report of a piece of glass passing through the ciliary body and lodging against or near the nose, and I thought we should have enucleated the eye, but we did nothing, and the boy has good sight today, except a localized cataract. This was four years since.

DR. A. R. BAKER, Cleveland, O.:—With regard to the injuries about large manufacturing plants, such as we have in a city like Cleveland, there is not the danger of sympathetic ophthalmitis that there is in the injuries received on the farm or in the street. I have used the giant magnet in two or three hundred cases and have not had a case of sympathetic ophthalmitis in any of them, so that I do not feel the same fear that some have expressed with regard to it. I have also not felt the same fear of the "danger zone" as we were taught in my student days. It seems to me that sympathetic ophthalmia comes from the kind of infection, rather than from the part of the eye injured.

I want to confirm the favorable statements with regard to the Gifford treatment. Only recently I put myself on record as not having perceived good results from the use of salicylate of soda. I wish now to say I did not appreciate the importance of large doses. I was in the habit of giving 30 to 40 grains daily. Last spring I had a case of sympathetic ophthalmitis in my office when Dr. Gifford visited me. I was giving 60 grains a day to a woman weighing 120 pounds. He said, "You are not giving her enough." So I gave her 120 grains daily and subsequently increased to 180 grains, and she took it better than 60 grains. Immediately her vision began to improve and she has now about 20/70 of vision. I would have been sure, the way the case was going and with my experience in other cases, that she would have been blind before this time.

DR. R. A. REEVE, Toronto, Canada:—I believe it takes a great many cases to enable us to establish a rule, but I personally subscribe heartily to the doctrine that enucleation of a damaged eye that should be sacrificed influences favorably the other eye already attacked sympathetically. I recall two cases of sympathetic ophthalmia conducted to a perfectly successful issue after enucleation; and also a case of perforating wound quite transversal from the center of the cornea through the ciliary region, where I inserted fine sutures, and which was followed by sympathetic ophthalmia. Getting the case early and dilating the pupil fully and maintaining mydriasis, calomel being exhibited, a very satisfactory result was reached, the injured eye also being preserved with useful sight.

DR. FERNANDEZ, Havana, Cuba:—Consideration about sympathetic ophthalmia cannot be made in general. It is necessary to consider every case

by itself, as it occurs, after all, in all diseases. The enucleation of an eye should not be commanded because it has been injured in the ciliary process. We constantly see eyes that have been injured in the ciliary processes a long time ago and which do not suffer any. I think that a large amount of discretion is necessary before we can decide in every case. We ought to take into consideration that an eye, no matter how much injured it may be, is better than an artificial eye. We also should remember the damage that is done in the social and the working life of an individual that has had an eye removed. There is a great responsibility in enucleating an eye and in not enucleating it in time. I think that the most important thing in sympathetic ophthalmia is to watch constantly the injured eye and be ready to operate when necessity arrives; that is, when true symptoms of sympathetic ophthalmitis develop. No patient should be allowed to go far away without warning him of the danger.

DR. JOHN E. WEEKS, New York City:—This subject is of course of the greatest interest to us all. With regard to the removal of an injured eye, we all recognize the fact that the wishes of the patient determine in some degree the action of the surgeon, as Dr. Fernandez has said. If we remove an eye that may possibly be saved with not much change in appearance, we introduce an annoying factor into the life of the individual. I do not think, however, that the wishes of the patient should influence the surgeon in regard to his statement of the facts in the case. The surgeon should state positively whether the eye should be removed or not, and if the injury is through the ciliary region and may cause sympathetic ophthalmia, he should advise enucleation at an early date. I am advising enucleation more and more as I grow older in the practice of ophthalmology. I do not think it wise to temporize in cases of this kind. If there is any doubt in my mind whether an injured eye will produce sympathetic ophthalmia or not, I advise enucleation.

With regard to incised wounds in the ciliary region, there are about ninety ciliary processes, and it is impossible to say whether the incision passes between the processes or not. I agree with Dr. Fox that a simple incision is less apt to produce sympathetic inflammation than one that is not so located.

In regard to the value of Fuchs' researches. He shows us that certain specific changes take place in the eye as a result of injury (probably an infection) that produces sympathetic ophthalmia, and that the injured eye is, in all probability, the source from which the infectious material passes to the other eye. I am inclined to think Fuchs is right in saying that it is carried by the blood stream from the exciting to the sympathizing eye. This theory serves to explain why, after enucleation, we may get an attack of sympathy in the other eye, that the virus is already on its way from the exciting eye, and has not reached the sympathizing eye. The exciting eye is a feeder, a source from which the poison, whatever it may be, is emanating, and unless the prospects are that the vision in the exciting eye will be better than in the sympathizing eye, the exciting eye should be removed.

JOHN O. McREYNOLDS:—Many theories have been advanced since the days of McKenzie to explain the causation of this disease and the mechanism of its production, and yet it remains today the darkest page in ophthalmic pathology, and even the avenues through which it travels are veiled in the deepest obscurity. No human being knows the origin of the malady, nor can we foretell the advent of the disease, its course or its final result. In the first place it may occur after a variety of conditions in the experience of any of us and after our most faithful service. In every intra-ocular operation the risk of sympathetic ophthalmia must be duly con-

sidered. For instance, Dr. Hermann Knapp of New York, who holds in America the highest record for successful cataract extractions, has estimated that once in every 750 operations of this kind in his own hands sympathetic inflammation has resulted. Mr. Lister of London had four cases of sympathetic ophthalmia follow his most carefully performed cataract extractions; and another most distinguished English ophthalmic surgeon had at one time two cases of sympathetic ophthalmia following extraction for monocular cataract. In the Royal London Ophthalmic Hospital reports for 1908, I find that one-half of all the cases of sympathetic ophthalmia mentioned in this report have followed the operation of cataract extraction, and in the museum of this same institution I find, in studying the histories of the various specimens of eyes, that have given rise to sympathetic inflammation, that one-half of the total number could be traced to some form of operation. In a series of cases recently reported by Fuchs were four cases following cataract extraction.

These facts are not generally recognized by the profession because ophthalmic surgeons find little delight in the publication of such unfortunate results. And yet it is well that the oculist should be forcibly impressed with the possibility of such a termination that he may weigh well every factor involved in the choice of his operation and every detail of its execution. It is also to be desired that the family physician should realize in referring his patient that the unexpected may possibly occur.

In reviewing the literature on this subject and in making a personal study of all the cases of sympathetic ophthalmia to be found in the museums of the Royal College of Surgeons of England and of the Royal London Ophthalmic Hospital, I have been struck with the small number of cases resulting from the uninterrupted retention of a foreign body. The vast majority resulted from wounds, accidental or designed, and never associated at any time with the retention of a foreign body. It must be distinctly understood that sympathetic inflammation does occur while the foreign body is still retained within the eye; but this other most important truth must be always before us, that our battle is not over when we have brilliantly extracted a piece of steel from the corpus vitreum.

It is not simply the retention of a foreign body that should become the object of our solicitude, but we should ponder well with the deepest concern the influence of the wound produced by the steel and also the wound occasioned by the operation for its extraction.

I have today a patient from whose vitreous chamber I recently extracted a piece of steel that had been imbedded near the posterior pole for three and a half years and yet never developed a genuine sympathetic inflammation but only a sympathetic irritation, which promptly subsided after the operation. In the injured eye there was also a secondary cataract with posterior synechia requiring a broad iridectomy with an extraction of the lens which secured for the patient useful vision.

I have recently obtained 20/20 visions in another case by removing, through the sclera, a piece of steel that had been lodged posterior to the ciliary processes for more than seven months, and yet without the production of sympathetic inflammation. On the contrary, I have had one case of sympathetic ophthalmia develop two weeks after the removal by Haab's magnet of a piece of steel imbedded in the eye only forty-four days. Again, two women who had been gored by a cow in very much the same manner, causing the direct loss of one eye in each case. In one instance there was no subsequent involvement of the uninjured eye; in the other, transferred ophthalmitis developed about six weeks after the original injury.

Thus it has been a matter of repeated observation by all ophthalmic clinicians, that it is utterly impossible to say in any given case, from the character of the injury received, whether or not there will ever develop any sympathetic involvement. Moreover, the element of time is a most variable factor, and I have seen it develop after a scratch by a cat after an interval of sixty years, and again I have had a patient brought to me totally blind, having been struck on the eye four weeks before; while other cases have been reported as occurring after the minimum period of ten days.

In a most excellent paper (presented before the Brit. Med. Assoc.) by Arnold Lawson of London, propounds a series of very pertinent questions:

1. Can it be definitely stated of any wound of the globe that it will inevitably produce sympathetic ophthalmia in the other eye? And he replies: My answer to this would unquestionably be in the negative. One is inevitably led to the conclusion that sympathetic ophthalmia is an accident to be dreaded and not a certainty to be foretold.

2. Are there any premonitory symptoms which may be accurately described as heralding the approach of sympathetic ophthalmia, and upon the advent of which a surgeon, by immediate enucleation, may prevent the onset of the disease? He answers: Most unfortunately it is here that our knowledge fails us. I know of no symptom that can thus be accurately described. The advent of any of the usual clinical signs is sure evidence that the disease is already present.

DR. LEARTUS CONNOR, Detroit:—I know nothing in the whole range of ophthalmology of such great uncertainty as this. If we knew that in a particular case we had sympathetic infection our management would be clear. With reference to the giant magnet, I have never had sympathetic irritation or inflammation following its use. I suspect that Dr. Donovan's favorable report on conservative management of eye accidents was possible because of the peculiar conditions attending such injuries, in that mining region, explosions, etc., and an unusual freedom from human filth. The most troublesome sympathetic eye case I ever had was caused by the slight touch on the cornea of a carpet tack. I think experience has shown us that all treatment, excepting surgical, is antiseptic. Mercury, iodide of potash, the salicylates, etc. I exceed Dr. Gifford's rule very much and I never have regretted it.

DR. YOUNG, Burlington, Ia.:—This is to a degree a Sir Roger de Coverly affair. There are two standpoints to view from. I think the older men are all prone to enucleate, for the reason that they have seen sympathetic ophthalmia. I have seen six cases, and one is enough to make a man anxious to enucleate. But like Dr. Baker, I do not think it is a question so much of the injury as of the individual. Unfortunately, as Dr. Connor has said, Fuchs' observations do not help us, because we have to make our decision from the clinical standpoint. I have a case that has been on my hands for two years—not one for which I was responsible. The eye was enucleated too late. I want to commend to the younger men a little search into ancient history, as it is called, the famous monograph of Mauthner of thirty years ago.

DR. EDW. JACKSON, Denver, Colo.:—I have seen five cases of sympathetic ophthalmitis, two in my own practice, three in the practice of others, in which enucleation of the exciting eye was done early, and all of which recovered useful vision. In three the sympathetic ophthalmia had occurred several days before the enucleation of the exciting eye, and vision was greatly reduced. In one the inflammation occurred two or three days after the enucleation, and in one as late as three weeks after. In the later of these cases sodium salicylate was used freely.

But I do not recall its having been used in doses of more than a grain to the pound weight in twenty-four hours. In the earlier cases improvement took place with the very free use of mercury. The patient was kept with all he could stand without serious damage for some time. I think for an eye that is lost, with any possibility of a foreign body in it that cannot be extracted, enucleation is to be done at once. But an eye that has received a piece of steel, and after extracting the steel is not absolutely blind, I would not enucleate if it were possible for the patient to remain within reach of any good ophthalmic surgeon. But I would dismiss him with the strongest advice, that on the first evidence of inflammation he should have that injured eye removed.

DR. LINN EMERSON, Orange, N. J.:—I wish to report a case which I enucleated three weeks ago in which the period of quiescence was between forty-five and fifty years. The injury occurred so early in childhood that the man did not know what was the cause of the injury, and he had no trouble until a few weeks ago.

DR. FRANCIS VALK, New York:—In listening to the discussion the question arises in my mind, how we shall guard against sympathetic ophthalmia, because it seems to me we are liable to have it even from a simple cataract extraction. Now, although I believe in the danger zone, my action is governed by my individual opinion of the damaged eye. If I think there is hardly any possibility of useful vision, and this man is a working man, I think it is better to enucleate at once. I think we are better protected in this way, because we cannot know but the injury may result in sympathetic inflammation.

DR. F. G. STUEBER, Lima, O.:—The subject is of intense interest to me. I still believe in the danger zone, having seen two cases wherein the patients lost vision in both eyes and where the exciting eye had an injury in the ciliary zone. I think, as has been stated, that slight injury, as punctures from a tack or prick of a pin, is at times more dangerous than a cut from a knife or scissors blade, where the escape of fluid may wash out the infection. Possibly a paracentesis might avail something where the wound is in the cornea. This might flush out all infection. I think that the early treatment has much to do in determining the prognosis of the case. Often the family physician who first has the case keeps it under observation much longer than he should. It is well for them to know that there is such a thing as a danger zone, and that slight injuries may become just as serious as greater ones.

DR. HOWARD F. HANSELL, Philadelphia:—It must be remembered that all diseases that come to the second eye after the first has been injured or enucleated, are not sympathetic. A few years ago a paper was read—but never published—before a society of which I am a member. A patient had had one eye enucleated because of chronic irido-cyclitis. The author reported sympathetic involvement of the second eye six months later, and endeavored to strengthen by this illustration the opinion that enucleation is not a preventive of sympathetic ophthalmia. It was conclusively demonstrated that in this case there was no question of sympathy, and that the second eye was lost because of syphilitic uvetis, an inflammation exactly similar to that which had destroyed the first eye.

When the injured eye is not inflamed and not tender to the touch, I do not believe sympathetic inflammation occurs. On the contrary, there must be some active process going on in the eye to produce the sympathetic inflammation.

DR. PERCY FRIDENBERG, New York:—I would make this point, that the difficulties of decision in cases of sympathetic ophthalmia are enor-

mously increased when it is not an injured eye but an inflamed eye which is exciting sympathy in the other, and where, as in old synechiae, the original affection is apparently slight. In these cases of non-traumatic inflammation, in which the exciting condition is not an evident wound, ciliary or other, or its sequelae, but an apparently comparatively mild affection, our responsibility is great. The patient cannot understand why such an eye should come out. He has not had the "suggestion" of previous injury to put him in the frame of mind to sacrifice an organ. In a medico-legal aspect, too, this point may become extremely important, if the surgeon is called upon to justify the surgical removal of an uninjured and still seeing eye. We must call the attention of the student and practitioner to the fact that not only ciliary wounds, but many other conditions, such as cyclitis, old iritic adhesions, adherent leucomata, cystoid scars, encapsulated prolapses, and even a phthisical globe, if irritated or infected, may cause sympathetic ophthalmia of the most severe type and require the removal of an eye which still has some vision.

DR. ROY (closing):—With reference to Fuchs' findings, I am of the opinion that as yet they do not offer any value to us as to knowing what to do and what not to do. We see certain changes after the eye is enucleated, but how that will help us to decide I cannot see. The idea is that the changes are produced by certain micro-organisms, and if we can discover these we might have some value from it. With reference to considering the patient, I think we all do that, but in many cases we will find we are on the wrong side, because we allow our sympathy for the patient to overcome us and we do not act as our best judgment teaches us, and consequently when it comes to a case of a badly damaged eye we should do what is going to be for the best interest of the patient. All the theoretical reasoning in the world is not worth a lot of practical experience, and I am always glad to hear from the older men who practice ophthalmology, because I can learn from them what we cannot find in text books. We are not far from McKenzie's theory of the reflex irritation through sympathetic nerves. It is only by getting together and reciting cases that we are able by the sum total to get more useful and valuable information on the subject.

THE NATURE AND TREATMENT OF PTERYGIUM.

JOHN McREYNOLDS, M.D.

DALLAS, TEXAS.

Before proceeding to a discussion of the treatment of pterygium it would be well to consider the nature of the growth and the circumstances under which it develops. So eminent an authority as Fuchs speaks of pterygium as a growth peculiar to those past middle life, and while this may be true of Vienna and the country surrounding that city, it certainly is not true of the southwestern part of the United States, where I have been practicing ophthalmology for a number of years.

In this region, where we have the combination of summer heat from April to November, with a dry atmosphere agitated by high winds and impregnated with alkaline dust, we will find the ideal conditions for the development of pterygia. Consequently, it is not at all infrequent to see boys in that country afflicted with pterygia of small size, while among those who are older we see pterygia growing from both the inner and the outer canthus until they practically cover the entire cornea, reducing the vision to the dim perception of large objects. This tendency to pterygium is by no means the same throughout the region of the southwest, but is found especially in those districts where the conditions mentioned above are so abundantly supplied.

In the Southwest, embracing that territory lying between the Mississippi River and the Pacific Ocean and between the Gulf of Mexico and the Mexican Republic on the south, and the continuation of Mason and Dixon's line on the north, we have a vast variety of climates and of soils. And, it has been my observation that patients coming from the still, warm, humid regions of the South are not so frequently nor so seriously affected with pterygium as are those coming from the warm, dry, windy and dusty regions of the same latitude. Heat, a dry atmosphere and high winds will cause the maximum degree of evaporation of moisture from any surface, and the combined influence will be felt upon any exposed mucous membrane. And when these factors are exerted almost continuously on the structures in the palpebral opening for many years, and are reinforced by enormous quantities of alkaline dust, which clings to the eyeball about the sclero-corneal junction and the inner and the outer canthus, and is not wiped away by the motion of the lids, but rather heaped up in the axis of the pal-

pebral fissures, and when the evaporation of the tears is so rapid that they do not accumulate in sufficient quantity to wash away the foreign particles accumulating on the globe, then we have conditions most favorable for the development of pterygia, as experience has shown. And, not only do we observe the difference in liability to pterygia among the inhabitants of different localities, but in any given locality pterygia will be far more frequent or much more severe among those who are exposed to the irritating effects of direct sunlight, wind and dust. Thus I find that I have many more cases of pterygia among ranchmen and farmers than I do among women and men of sedentary occupations, although the latter class will apply much earlier for relief on cosmetic grounds.

I would conclude, then, from my experience, that pterygia are produced by the long irritating action of several factors, chief among which are heat, a dry atmosphere, high winds, exposure to sunlight and an abundance of dust, especially of alkaline character. Then, with these facts of causation before us, we must recognize that an important part of the post-operative treatment will consist in the removal, as far as possible, of those conditions which favor the development of the growth in the beginning. We therefore must recognize that a pterygium that would prove harmless in New York or Vienna, might prove distinctly injurious on the plains of western Texas or New Mexico. We must also recognize that a method of operation which could give satisfactory results in New York or Vienna might not succeed to the same degree on the plains of the far Southwest.

All forms of simple abscission requiring a break in the conjunctiva along the axis of the palpebral fissure must be more or less unsatisfactory, because this will demand one or more sutures for bringing the divided parts in apposition, and the line of union is apt to be associated with some thickening of the tissues, and seldom is altogether as smooth as the normal conjunctiva. Hence the irritation consequent upon these conditions will serve to invite the neighboring subconjunctival vessels and thus cause a return of the growth in some cases. In my own experience, among a people who are afflicted with pterygium as frequently as the inhabitants of any part of the world, I must say that my results have been far more satisfactory with the method of transplantation than with any method of simple abscission. But the exact way in which this transplantation is accomplished has much to do with the success of the operation, and after a very thorough trial of the various procedures along this line I have finally

adopted a plan which has never disappointed me a solitary time within the last few years. It is a modification of the old operation originally devised by Desmarre, but it differs in some very important features from Desmarre's operation.

The details of the operation are the following: (1) Grasp completely the neck of the pterygium with strong but narrow forceps. (2) Pass a Graefe knife through the constriction and as close to the globe as possible, and then with the cutting edge turned toward the cornea shave off every particle of the growth smoothly from the cornea. (3) With the fixation forceps still hold the pterygium, and with slender, straight scissors divide the conjunctiva and subconjunctival tissue along the lower margin of the pterygium, commencing at its neck and extending toward the canthus, a distance of one-fourth to one-half of an inch. (4) Still hold the pterygium with the forceps and separate the body of the growth from the sclera with any small non-cutting instrument. (5) Now separate well from the sclera the conjunctiva lying below the oblique incision made with the scissors. (6) Take black silk thread armed at each end with a small curved needle and carry both of these needles through the apex of the pterygium from without inwards and sufficiently separated from each other to secure a firm hold. (7) Then carry these needles downward beneath the loosened conjunctiva lying below the oblique incision made by the scissors. The needles, after passing in parallel directions beneath the loosened lower segment of the conjunctiva until they reach the region of the lower fornix, should then emerge from beneath the conjunctiva at a distance of about one-eighth to one-fourth of an inch from each other. (8) Now, with the forceps lift up the loosened lower segment of conjunctiva and gently exert traction upon the free ends of the threads, which have emerged from below, and the pterygium will glide beneath the loosened lower segment of the conjunctiva. The threads may now be tightened and tied, the surplus portions of thread cut off, leaving enough to facilitate its removal after proper union has occurred.

It is very important that no incision be made along the upper border of the pterygium, because it would gap and leave a denuded space when downward traction is made upon the pterygium. On the contrary, the elasticity of the conjunctiva is such that when this downward traction is exerted upon the head of the pterygium, the conjunctiva becomes thinned out and smoothly applied to the sclera corresponding to the former site of the body of the growth and the margin of the conjunctiva coincides

accurately with the sclero-corneal junction. Thus, when the operation is completed and the speculum removed, no stitch is seen, because it is hidden by the lower lid; the only denuded area is on the cornea. The former site of the body of the pterygium is covered by a thin and comparatively non-vascular conjunctiva, and what blood vessels remain are directed downward and not horizontally, and hence do not tend to encroach again upon the cornea. In fact, the whole vascular activity is concentrated beneath the lower lid, where it is not only removed from view, but protected from the irritating influences of dust and exposure, and the process of atrophy naturally and surely follows. In the meantime the corneal wound heals quickly and the thin conjunctival tissue becomes closely adherent to the sclera in the palpebral opening. After a few days the single stitch can be removed and the old pterygium will be found firmly adherent to the sclera and hidden beneath the loosened lower segment of conjunctiva. If the head of the pterygium is very large it may be cut off before the growth is drawn down beneath the loosened lower segment of the conjunctiva.

The general direction of the traction threads is vertical, but generally it is best to incline them in such a way that they will emerge from that part of the conjunctiva which lies below the cornea. This may be necessary many times in order that all of the denuded sclera may be completely covered by smooth conjunctiva. If the conjunctiva should slightly overlap the cornea at any point, it can easily be trimmed smoothly away without interfering with the desired result. If the head of the growth is very large so that it covers something like a third of the cornea, and if the body is also very thick and fleshy, it may be best to dissect away the head from the cornea with a sharp knife and then remove with scissors the head and a part of the subconjunctival portion of the body of the growth, and then proceed with the rest of the pterygium according to the method already described.

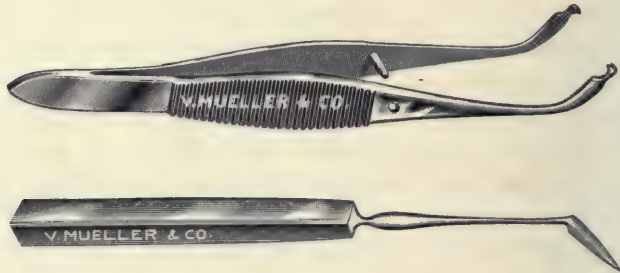
1. *The Preparation of the Eye.*—Of course, as in all other ophthalmic operations, it is desirable to have, as far as possible, a clean field of operation, and yet I have never seen infection follow this operation, even in cases in which a distinct conjunctival discharge was present at the time of the operation. One would certainly not prefer any kind of surgical procedure in the presence of an acute purulent conjunctivitis, but a low grade of chronic conjunctivitis with slight secretion, the complete cure of which would be retarded by the existence of the pterygium,

would not offer a valid objection to the removal of the growth. In cases of this latter kind reasonable safety would be secured by flushing the conjunctival sac with a five per cent solution of argyrol, and then following this with free irrigation with any mild non-irritating antiseptic solution. Complete anesthesia can be easily obtained by instillations of five per cent cocain solution in ordinary cases. But when the growth is very thick and fleshy, the so-called pterygium crassum, I invariably apply a few crystals of cocain directly to the head and neck of the pterygium, and this procedure insures absolutely perfect anesthesia.

With reference to agents employed to control hemorrhage at the time of operation, I will say that the judicious use of adrenalin chloride can do no harm in any case, but I practically reserve this for the more vascular forms. Of course, it may be said that the action of adrenalin chloride will render less distinct the outlines of the growth and thus interfere with the accuracy of the procedure; and while this in a measure may be true, still I am convinced that if the operator possesses good vision and a true hand he will always be able to remove completely every vestige of the growth. On the contrary, there are some elements of value in adrenalin in addition to its power of controlling hemorrhage. For, when the pterygium is very broad and fleshy, it so largely conceals the knife transfixing the growth that you may not be able to gauge properly the depth of your corneal incision. Now the action of adrenalin will increase the transparency of the growth and enable you more definitely to determine the situation of the advancing knife.

2. *The Removal of the Growth.*—Grasp firmly the neck of the pterygium with strong but narrow fixation forceps, thus lifting the growth freely from the underlying sclera. The forceps which I now employ for this purpose I have devised, so that with the narrow extremity the growth is securely held while the flattened serrated segment adjacent to the point can subsequently be used as a needle holder, thus reducing the number of instruments required in the operation. The forceps should not be provided with a lock, as the operation of the lock would be wholly unnecessary and would contribute nothing to the speed, facility or accuracy of the procedure. Originally I advised that while the growth is being held by the fixation forceps, a Graefe knife with its cutting edge directed towards the cornea should be made to transfix the neck of the pterygium, and then to shave off every particle of

the growth from its corneal attachment. And I still must say that in the majority of cases the Graefe knife supplies every indication, but it sometimes occurs that a very projecting brow or a very broad pterygium would present difficulties in the way of manipulating a Graefe knife at right angles to the inter-palpebral fissure. To obviate this difficulty I have devised a special pterygium knife which is essentially a short-bladed, double-edged Graefe knife placed at an angle of 135 degrees with the axis of



the handle, thus resembling a very narrow angular keratome. This arrangement enables the operator, by standing at the head of the patient, to introduce the knife with equal facility on either side of either eye, and also to cut in any desired direction without changing the relation of patient and surgeon. It is essential that the knife be very narrow so that it can transfix the neck of the growth without first cutting laterally to any marked extent. Then, when the point has well emerged from beneath the neck of the pterygium, the knife can be made to shave off every particle of the growth from its corneal attachment. I cannot emphasize too strongly, in this connection, the absolute necessity of complete removal of the growth from the cornea. I have repeatedly demonstrated that in a given pterygium, if a portion of the head is radically removed and a portion is imperfectly removed, the tendency to recurrence is manifested in far greater degree in that part corresponding to the incomplete removal.

The pathology of pterygia clearly proves that the growth, if fully developed, involves not only the epithelial layer and Bowman's membrane, but also the superficial laminae of the corneal stroma. And, as stated above, experience has abundantly shown that any procedure failing to include every vestige of this abnormal corneal involvement must also fail to secure the nearest approach to a perfect result with the minimum tendency toward a

recurrence. Hence it is that all forms of divulsion and ablation by means of dull instruments must fall short of the highest efficiency because they necessarily fail to reach the foundation layers of the corneal invasion and leave a surface better adapted to the return of the growth.

I do not mean to say that splendid results have not been attained by divulsion, for I have many times successfully employed this method myself. But I am thoroughly convinced that such procedure, while it may yield excellent results in some localities, cannot stand the test of comparison under atmospheric conditions strongly favoring the development of pterygia. In other words, in some localities almost any method will succeed, while in other localities a successful result will require a more careful attention to every detail of thoroughness and every element of safety. And, since a radical removal of the head is a matter of great importance, it is essential to the highest efficiency that the pterygium knife should be as sharp as possible both in its point and cutting edge. In fact, I have found it useful to guard with as much care the keenness of a pterygium knife as I would that of a cataract knife.

In very broad and fleshy pterygia the usual plan of transfixion and subsequent ablation as described above must be modified in accordance with the area involved. Suppose, for instance, a pterygium covers one-third of the cornea with a dense vascular mass, and you transfix the neck with an instrument having straight cutting edges, like a Graefe cataract knife; as the knife advances over the cornea from the neck to the apex its (area of cleavage) track or path is not the surface of a sphere, with the normal corneal curvature at all times equally distant from the membrane of Descemet, but its path is in a single plane cutting off a segment of a sphere whose periphery involves only the most superficial layers of the cornea while its center may involve the entire thickness of the cornea. In such cases the head of the growth must be dissected away from the cornea very thoroughly and carefully. The success of this procedure will depend in large measure upon the sharpness of the instrument employed and the facility with which it may be made to change its direction in accordance with the curvature of the cornea, thus permitting the operator to gently insinuate the blade of the knife between the affected superficial and the deeper normal lamellae. If the pterygium is very broad and vascular and has penetrated deeply into the corneal

tissue with a constant softening of the stroma, it may be well to slice off the affected lamellae in sections, thus obviating the danger of leaving too thin a denuded area of the cornea. It is important, also, to remember that this process of complete removal must extend to the neck of the growth as it passes over the limbus.

The separation of the body of the growth from the underlying sclera to which it is always very loosely attached, excepting in cases that have been unsuccessfully operated, may be accomplished by a variety of instruments. I generally employ for this purpose the point of the *closed* Stevens strabismus scissors, which is useful also in undermining the conjunctiva above the pterygium and in making the subsequent oblique incision along the lower border of the pterygium, and in undermining the conjunctiva below this oblique incision, and also in removing, when necessary, any portion of the growth or of the vascular sub-conjunctival tissue beneath it. It sometimes occurs that the head or the body of the growth may be so large and bulky that it is unnecessary for the smooth performance of the operation to preserve every portion of this growth in transplanting, and so I am in the habit of cutting away in such cases the superfluous tissue. But it is essential that this cutting away process should be confined to the horny portion of the head, the lower margin of the body and the vascular subconjunctival tissue, always preserving intact the superior margins of the pterygium in order that we may be able to utilize to the fullest extent the elasticity of the unbroken conjunctiva above the growth in covering smoothly the denuded area of the sclera when downward traction is made upon the head of the pterygium.

In order that the pterygium may easily and freely glide downwards when traction is exerted upon it, we must be careful to thoroughly undermine the conjunctiva above the growth; especially must we ascertain whether all conjunctival fibres in the immediate vicinity of the neck are freed from their attachments at the limbus. The exact position of the oblique incision along the lower border of the growth necessarily varies with the breadth of the growth; and in no case should this incision encroach upon the pterygium, either in its body or at its neck. No harm would result, but greater safety is secured by allowing a margin of one millimeter or more between the lower border of the growth and this oblique incision.

I have tried all of the various forms of suture material, and that which has been most satisfactory has been fine black silk

thread. I formerly allowed the stitch to remain four days, but I have found that sufficient adhesions will frequently occur within one or two days, and this is a matter of some moment to patients living at a distance and who would prefer to remain away from home under the direct care of the oculist only until the stitch could be removed. I still find it preferable to employ a thread armed at both ends with small curved needles. The smallness of the needles is of some consequence when we are dealing with cases of fragile conjunctiva. I have closely compared the cases in which the needles were inserted into the head from without inwards with the cases in which the needles were inserted from within outwards and I have not been able to discover any difference in the results. The direction of the two threads, as they pass almost parallel beneath the loosened lower segment of the conjunctiva, may vary somewhat according to the elasticity of the conjunctiva and the scleral area to be covered by the attenuated conjunctiva from above the growth. Generally, they will emerge near each other in the region of the lower fornix under the center of the cornea, but these positions may be modified slightly according to the denuded area to be covered and the degree of traction which is exerted upon the threads. The essential object to be attained is to so direct the threads and so regulate their tension that the normal conjunctiva above the growth shall be made to curve accurately around the denuded limbus without encroaching upon the cornea or without leaving any portion of the sclera uncovered. If your calculations have not been perfectly accurate and you find some overlapping of the cornea, the needles could either be introduced again or the overlapping conjunctiva could be very carefully trimmed away along the line of the limbus.

After the tying of the threads has arrested the insignificant oozing which may sometimes occur, it is well to carefully inspect the field and especially to ascertain if every vestige of the growth has been removed from the cornea. If it has not been thoroughly removed the corneal wound will not reveal a transparent stroma, but will show a certain degree of vascularity or opacity which would indicate the necessity of further attention. Then we can again resort to a perfectly sharp pterygium knife and shave off every particle of the pathological tissue, leaving a smooth surface over a transparent cornea.

Practically the only discomfort to be apprehended will be in the first few hours succeeding the operation, and this can be effectually relieved by cold applications and the occasional instillation

of a weak anesthetic. A light bandage should be worn for a few days and the patient instructed to avoid, as far as possible, those conditions which have a tendency to favor the development primarily of this affection. All errors of refraction, especially the astigmatism usually present, should be corrected, and appropriate treatment instituted for any kind of ocular disease which may exist at the time.

In operating for extensive pterygia in those advanced in years I usually instill a few drops of pilocarpin solution in the eye after operation in order to avoid any possible development of glaucoma that might arise from the action of the cocaine and from the loss of sleep and from the nervousness incident to the operation. This necessity is not purely theoretical because I recall very well a patient who was brought to me completely blind with glaucoma that had developed immediately after an operation on each eye for pterygium when there had existed no previous symptoms of the disease that could be ascertained from his history.

Causation.—Some excellent authors speak of pterygia as a disease confined to those who have passed the middle period of life, and while this may be true of some localities it is certainly not true of the southwestern part of the United States, where I have observed this condition well established in boys under ten years of age. It is true, however, that pterygia do show a much more decided tendency to develop as age advances, and this may be due in part to the physiological changes taking place in the conjunctiva, but chiefly to the fact that the period of greatest business activity is likely to be the period of greatest exposure to atmospheric conditions which favor the development of the growth. Of course, this applies especially to those whose vocation involves exposure to a dry heated atmosphere more or less filled with dust and agitated by winds. The same may be said of the influence of sex and occupation.

Women, while by no means immune, are much less frequently and severely affected with pterygia than men, because their lives are spent largely indoors, hence better protected from the irritating effects of exposure. Occupation, likewise, exerts a powerful influence; but the whole matter hinges upon the exposure to wind, dust and a dry heat and it attacks with equal energy the ranchman who owns a million acres of land and the poorest cowboy of the plains, provided their exposure is the same. It is especially important to remember that the same conditions which favor the primary development of the growth will also favor its recurrence after removal.

The frequency of the growth as observed in different parts of the world emphasizes the genuineness of the causative factors above mentioned. For instance, one of the leading ophthalmic surgeons of London told me that he was sure that he had not operated on more than half a dozen cases of pterygia in private practice during his entire career. While in Texas I am sometimes called upon to operate on more than that number in a single afternoon. This vast difference in the frequency of the growth in different localities is also clearly brought out in the hospital reports of various cities and confirmed by the private practice of the attending surgeons. The same factors which are prominent in determining the frequency of the growth are likewise prominent in determining its extent and severity. In those countries where the growth is infrequent it is also diminutive in size and shows only a limited tendency to recur. In those countries in which the growth is very frequent it is also less regardful of age, sex or occupation, it develops to a much larger extent, advancing over the cornea, sometimes from both the inner and outer sides until they meet in the center, covering easily $5/6$ of the cornea and leading to practical loss of vision with an increased inclination to return after removal. These severe cases may interfere with the proper function of the eyes by direct obstruction to the entrance of light, by producing an irregularity in the corneal curvature and by restraining the motility of the eyeball by virtue of the traction exerted upon the cornea.

All of these evil effects are intensified by some operative procedures which are unsuccessfully employed, and a case which has once recurred presents increased difficulties in the way of a perfect result. While no pterygium can be removed by any method other than operative, still a course of treatment which will allay conjunctival irritation will tend to retard the progress of the growth.

One of the most interesting questions in connection with the origin of pterygia relates to the influence of pinguecular and corneal ulceration. Many careful observers have been directly opposed on this point, hence a resort to authority cannot settle the dispute. I have tried in my humble way to study for myself the subject with an impartial mind. I have made it a practice to examine most carefully with the loupe a very large number of pterygia of all sizes and ages and stages of progress; and I have watched them advance from the very beginning to the fully developed state. I have employed fluorescin solutions to aid in the detection of the slightest corneal abrasion. And yet it has been the rarest thing that I have ever been able to detect any evidence

of a corneal ulcer leading the way for a pterygium, either in its beginning or in its progress. While I would not undertake to dogmatically state that a pterygium never grew as a result of corneal ulceration, I am nevertheless very thoroughly convinced that this possible association is more frequently accidental than essential. In the marginal ulcers of phlyctenular keratitis in children we would seem to have the most favorable form of corneal ulcer for the production of pterygia. Yet the facts are that pterygia are very seldom discovered as a sequel to phlyctenular keratitis. Again, in the multiple or in the deep forms of corneal ulcers to be found in connection with trachoma, we do not find pterygia in the upper segment of the cornea, which is the area most frequently invaded by the ulceration process. Indeed, experience shows that it matters not how numerous or how extensive the ulcers of the cornea may be, and it matters not where they may be situated with reference to the limbus, a true pterygium very seldom ever occurs in a situation that is protected by the lids. It occurs only in those areas that are exposed to the dessicating and irritating action of a hot, dry, windy atmosphere. Of all the factors leading to these pathological changes, I am convinced that the ones of greatest importance are heat and dryness. In the crowded dust laden factories and mines of the North we do not find anything like the same proportion of pterygia that we find in the heated, dry atmosphere of the Southwestern plains. An interesting feature in the progress of pterygia is developed in the method of its growth upon the cornea. When it first begins to advance upon the cornea, an elevated area of infiltration passes forward from the limbus dragging after it a fold of conjunctiva. Then the head, having been once thoroughly implanted upon the cornea, grows straight forward in a horizontal direction; at the same time it spreads out laterally so that the breadth of the head is much greater at some distance from the limbus than it is right at the limbus. This gives rise to the constriction known as the neck. Since the head is broader than the neck a fold of conjunctiva is drawn forward and spread out at the limbus without being attached to the normal cornea lying beneath it. It is a noteworthy fact that the head may then grow in every direction except in the direction of the areas protected by this overlapping conjunctiva. In fact this overlapping conjunctiva forms a kind of pocket above and another one below the pterygium. These pockets are ideal receptacles for various kinds of micro-organisms and small foreign bodies, and yet the cornea in this situation never becomes invaded by the pterygium itself. And thus we have demonstrated

in the most striking way the value of protecting the cornea as a means of preventing pterygia or retarding their growth.

DISCUSSION.

DR. G. C. SAVAGE, Nashville, Tenn.:—I want to say in behalf of my friend from the sunny South, that I do not believe any operation for pterygium has ever been given us equal to the McReynolds operation. He gave me a chance to steal it, he was so slow publishing the operation after describing it to me. The merit of the operation is not in *removing* the head of the pterygium from the cornea. I prefer traction. I pull it out by the roots. But the feature of the McReynolds operation is the disposition of the head after it has been removed, and nothing is equal to that. Study this operation carefully and I do not think you will do any other.

DR. FERNANDEZ, Havana:—In the operation for the removal of pterygium, which is a disease known since olden times, several methods have been employed. The method I use is in distending it as though to pull it off, without, however, pulling it off, and then I cut it with a scissors at the level of the cornea. Afterwards I excise it above and below, and lastly the base near the lachrymal caruncle. Most of the cases have remained cured, but some of them have recurred. In the latter they were mostly country people and exposed to the dust, air and sunlight; all these were causes of the primary pterygium.

The important thing in operating for pterygium is, I believe, to find out the cause of the propensity that some eyes have to the formation of pterygium and the recurrence after operation in others. With any operative procedure the patient gets cured in most instances.

DR. YOUNG, Burlington:—While I yield the palm to Dr. McReynolds for the best operation we know, I do not agree with him in regard to the head. Some of my cases have done better where the head has not been perfectly removed.

I have invented a knife I think is superior to his. It is a kidney-shaped knife, very broad, and it will follow the shape of the cornea almost in the dark. I do not attempt to take the head all at once, but introduce this kidney-shaped knife with the concavity forward and take what it holds. The most complete dissection of the head I ever made is the only one I have had to recur in ten years. There is another advantage in this knife; the convexity is also sharp. After you have removed the head of the pterygium, you can sweep back and clean off the sclera and curette the whole area.

DR. JACKSON:—I think there are two things essential to success in the removal of pterygium. The first is to thoroughly clean off the cornea, and for some distance back of the sclera, because some pterygia adhere remarkably to the region of the limbus. Second, we must place in the region of the limbus opposite where the growth was situated a thin portion of the conjunctiva. It should be so thin that the inflammatory swelling will not thicken it up so as to cause it to overlap the cornea.

DR. McREYNOLDS (closing):—I wish to thank the gentlemen who have so kindly discussed the paper. I must say that I deeply appreciate the cordial expressions of approbation that have followed.

There seems to have been only one difficulty apprehended in connection with the operation, and that is with regard to the overlapping of the cornea. I stated in my paper that if overlapping occurred you had simply to trim away that part and you would never know there had been any

overlapping. You make it coincide accurately' with the sclero-corneal junction.

As to Dr. Weeks' interrogation. I have never seen any cystic formation follow the operation.

In regard to the procedure when the size of the pterygium was large, as suggested by Dr. Suker, I stated that there was no objection to removing the head and a portion of the subconjunctival elements of the growth if necessary. The essential point in the operation is simply this, to have in the palpebral fissure a perfectly smooth conjunctival tissue and no heaping up of subconjunctival vessels, and no visible stitches, seam or denuded sclera, to indicate that an operation has been done. It is covered by perfectly smooth conjunctiva, and what vessels there are are in the conjunctiva corresponding to the former situation of the growth are running in a vertical instead of a horizontal direction, and there is no tendency to recurrence.

While the paper presented before the Ophthalmological Section of the American Medical Association in 1902 outlined the salient features in the operation for the usual types of pterygia encountered, still there are many additional points the recognition of which will lead to a higher percentage of perfect results. And my appreciation of the kind and generous reception accorded to my humble efforts on this subject by my esteemed confrères in ophthalmology has induced me to explain more fully than heretofore the details and rationale of the various steps of the operation which experience has shown to be worthy of thoughtful regard.

A STUDY OF HETEROPHORIA AND HETEROTROPIA IN DUCTION AND VERSION.

EDWARD LAUDER, M.D., C.M.

Associate Professor of Ophthalmology, Medical Department Ohio Wesleyan
University; Oculist St. Luke's Hospital, Cleveland City Hospital.

CLEVELAND, OHIO.

In the use of mechanical appliances for making an examination of the eyes, we occasionally come across cases in which the deductions arrived at from the findings, as determined by a certain appliance, are not strictly in accord with those arrived at by other means. To a limited degree this applies in the examination of the extrinsic muscles as made by a tropometer and by prisms. To be more definite, the dynamic condition of the recti muscles estimated by the results of *version*, determined by a tropometer, does not always strictly corroborate the dynamic condition of the recti muscles estimated by the results of *duction*, determined by prisms. The tests of version and duction are very valuable aids in dealing with muscular disturbances of the eyes and it is well to use one to corroborate the other where possible.

Duction can be used only in cases of binocular vision and, finally, has its greatest value narrowed down to cases of esophoria and exophoria. Version, on the contrary, is of value not only in esophoria and exophoria, but is our main reliance in cases of hyperphoria, determining which eye is the higher or which the lower, also in anaphoria, kataphoria and heterotropia.

As just stated, duction has its greatest value in cases of esophoria and exophoria, but I think I am safe in stating that there is no other appliance that can compare with a tropometer in aiding us to arrive at a satisfactory decision as to the *modus operandi* in the various conditions of heterophoria and the much abused condition—heterotropia or squint.

In the following few case reports I shall endeavor to illustrate the points I have raised as to the value of a tropometer, and also refer to the apparent lack of corroboration between the results of version and duction in some of the cases in estimating the dynamic condition of the internal and external recti. In the light of more mature experience some of the cases might have been dealt with differently as to the operative procedure, as I since have learned to depend more on version than on duction in esophoria and exophoria, whereas previously I depended too much on duc-

tion in those conditions. But I have no misgivings because the results, in relief obtained by my patients, justified the means.

The first series will deal with cases of exophoria; the second with esophoria; the third with hyperphoria, and the fourth with heterotropia.

Series A. This series comprises three cases of exophoria representing different types. In No. 1 there is a refractive error with a *manifest total* exophoria of 2 degrees, in which adduction is deficient. In No. 2 there is a refractive error with a *total* exophoria of 12 degrees, composed of 2 degrees manifest and 10 degrees latent, in which adduction is good, but abduction is excessive. In No. 3 there is *no* refractive error, but a *total* exophoria of 12 degrees, composed of 2 degrees manifest and 10 degrees latent, in which adduction is fair, but abduction is excessive.

Case 1. Miss W., age 36, referred to me in April, 1906, complained of temporal, vertical and occipital pain. My examination under a cycloplegic revealed a refractive error of simple hypermetropic astigmatism in each eye, patient accepting + 1.50 cylinder, axis 90 in the right eye, and + 1.00 cylinder, axis 90 in the left eye. With this correction 20/20 could be read with either eye. The static muscular condition showed a total exophoria of 2 + degrees and the dynamic condition a duction of 5 degrees with each external rectus and 6 degrees with each internal rectus. Version showed an excursion of 50 degrees in and 50 degrees out for each eye (55 degrees and 50 degrees respectively being considered normal). In this case duction and version corroborate each other, and indications clearly point to a shortening of the internal recti. Patient fairly comfortable but anticipates having operation at an early date.

Incidentally I may mention that some writers of text books advise that in prescribing for hypermetropes with exophoria, we should avoid giving full correction, as the accommodative effort made to overcome the uncorrected portion stimulates convergence. The theory is sound from the standpoint of physiology, but otherwise must be condemned, as it creates two wrongs in an effort to correct one, that is, it causes an effort of accommodation and of convergence in an attempt to overcome divergence. This patient already wore glasses and the prescriber had added — 0.25 spherical to each lens, which were plus cylinders, evidently to stimulate convergence.

Case 2. Miss A. W., age 24, referred to me in January, 1907, complained of a persistent, terrific frontal and occipital headache

for two months. Her facial expression was one of agony. She was wearing glasses ordered by an optician, being a poor attempt to correct the existing refractive error. Refraction revealed a compound hypermetropic astigmatism, right eye $+ 1.75 \text{ C} + 0.25 \text{ c.}$, axis 90, left eye $+ 1.25 \text{ C} + 0.50 \text{ c.}$, axis 90, correction of which did not give relief. The static muscular condition showed a *manifest* exophoria of 2 degrees and the dynamic condition a duction of 8 degrees with each external rectus, and 20 degrees with each internal rectus. By the use of prisms a *latent* exophoria of 10 degrees was developed, making a *total* of 12 degrees. Duction in the meantime increased to 20 degrees with each external rectus and remained at 20 degrees with each internal rectus. Version showed an excursion of 40 degrees inward, 46 degrees outward for the right eye, and 47 degrees inward, 42 degrees outward for the left eye. In this case duction and version did not corroborate exactly, but, rather, version showed a tendency to dextrophoria, a condition to which attention has been directed by Dr. Francis Valk (see Transactions of the Academy of Ophthalmology and Oto-Laryngology, 1905, page 187). After observing the cases three months I did a graduated tenotomy on each external rectus. Seven months later (November, 1907) eyes showed exophoria of 2 degrees; duction of 8 degrees with each external rectus and 20 degrees with each internal rectus. By combining a 1 degree prism, base in, for each eye, with her refractive correction, she is following an occupation requiring accommodative and convergent effort, is absolutely free from pain and has gained twenty pounds in weight. If I should have another case giving similar results in version I would shorten the right internal rectus in preference to doing a tenotomy.

Case 3. Mrs. B., age 54, referred to me in December, 1906. Complained of severe headache, nausea and vomiting, necessitating one or two days in bed almost every week. The facial expression was one of pain and expectancy. She had six pair of glasses, some intended to correct a static refractive error, others the presbyopic condition. Refraction revealed emmetropia. Examination of the muscular equilibrium showed a *manifest* exophoria of $2 +$ degrees with a duction of 6 degrees with each external rectus, and 15 degrees with each internal rectus. The case was followed for nearly three months, by which time a *latent* exophoria of 12 degrees had been revealed, making a *total* exophoria of 12 degrees. Duction increased to 12 degrees with each internal rectus and remained at 15 degrees with each internal

rectus. Version showed an excursion of 45 degrees in and 45 degrees out for each eye. I did a graduated tenotomy on each external rectus. Seven months later (October, 1907) eyes showed orthophoria. Duction of 6 degrees with each external rectus and 20 degrees with each internal rectus. While not relieved absolutely of her headaches, they are not nearly so frequent nor severe, the necessity of going to bed being avoided entirely, and the expectant and pained expression of countenance has disappeared.

Series B. This series comprises two cases of esophoria representing different types. The first has a high refractive error, a compound hypermetropic astigmatism in each eye, with a total esophoria of 12 degrees, in which abduction is normal but adduction is excessive. The second has a simple hypermetropia in each eye, with a total esophoria of 21 degrees, in which abduction is deficient and adduction is excessive.

Case 1. Mrs. G., age 19, referred to me in October, 1905. She was wearing glasses but complained of frontal headache and pain in eyes. Refraction revealed a high grade of compound hypermetropic astigmatism, right eye $+ 3.00 \text{ C} + 1.75 \text{ c.}$, axis 90, left eye $+ 3.00 \text{ C} + 1.25 \text{ c.}$, axis 70. There was a manifest esophoria of 10 degrees. I prescribed lenses for correction of the refraction error. With these she was comfortable for some months. In May, 1907, nineteen months after correcting refraction error, she returned, complaining of some discomfort about the eyes. Refraction was the same as previously, and a *manifest* esophoria of 8 degrees. Abduction was 6 degrees and adduction 22 degrees. By the use of prisms a *latent* esophoria of 4 degrees was developed, making a total esophoria of 12 degrees. Abduction remained at 6 degrees while adduction increased to 32 degrees. With a tropometer there was *version* of 48 degrees inward, 50 degrees outward for the right eye and 53 degrees inward, 44 degrees outward for the left eye, which again does not corroborate duction, but rather shows a dextrophoria. I did a graduated tenotomy of the left internal rectus on the 9th of July, 1907. Two months later, September 11, 1907, the static condition showed an esophoria of 4 degrees and a duction of 6 degrees with each external rectus and 20 degrees with each internal rectus. The patient expressed herself as feeling much more comfortable and was relieved of a strained sensation when she wished to turn her eyes to the left. In another case similar to this, depending on version rather than duction, I would prefer to shorten the left external rectus.

Case 2. Miss S., age 16, referred to me December, 1906. Was wearing -0.25 cylinder, axis 180 in each eye. Complained of headaches and pain in eyes. Refraction revealed simple hypermetropia of $+0.50$ dioptre in the right eye and $+0.75$ dioptre in the left eye. There was also present a *manifest* esophoria of 15 degrees and a duction of 6 degrees with each external rectus and 25 degrees with each internal rectus. The refraction error was prescribed for and ten days later patient reported decided improvement so far as personal comfort was concerned. In February, 1907, two months after correction of refraction error, patient returned and complained of not being so comfortable. Taking up the muscular condition I found esophoria of 20 degrees, and that duction showed 2 degrees for each external rectus and 32 degrees for each internal rectus. I prescribed temporary prisms, 3 degrees base out for each eye, to be worn over the refraction correction. Two months later (April, 1907) patient reported little improvement. Abduction 2 degrees each eye, adduction 35 degrees each eye. Version showed 45 degrees inward, 35 degrees outward for the right eye, and 50 degrees inward, 35 degrees outward for the left eye. In this case both duction and version point to the necessity of giving more power to the external recti muscles, which I proposed doing by tucking the tendons. To this the parents objected so I dismissed the case.

Series C. This group comprises two cases of hyperphoria, one with a refraction error and the other with normal refraction. It is in this form of heterophoria where we more thoroughly appreciate the value of a tropometer, as duction is of comparatively little value, and it is practically impossible to locate the defective muscle or muscles by that test.

Case 1. O. F., age 12, referred to me in December, 1907. Complained of headache, nausea and vomiting to such an extent that attendance at school was seriously interfered with. Refraction revealed a simple hypermetropia of $+1.25$ dioptres in each eye. The static muscular condition showed right hyperphoria of 12 degrees. *Version* showed an excursion of 33 degrees (normal) upward in the right eye and 22 degrees upward in the left. The tropometer findings point absolutely to the defective condition of the superior rectus of the left eye. On September 22, 1908, I shortened that muscle. The result of the operation was to reduce the hyperphoria to 2 degrees. By combining a prism with his refraction correction he is perfectly comfortable and pursues his studies uninterruptedly.

Case 2. Miss T., age 33, referred to me in November, 1907. Occupation, artist. Complained of sick headaches. Refraction normal. Static muscular condition shows a right hyperphoria of 4 degrees. *Version* showed an excursion of 33 degrees upward in the right eye and 30 degrees upward in the left eye. This patient is now wearing $1\frac{1}{2}$ degree prism, base down, in the right eye, and $1\frac{1}{2}$ degree prism, base up, in the left eye, and is very comfortable. The tropometer in this case again locates the weak muscle as being the superior rectus of the left eye.

Series D. This group comprises four cases of heterotropia or squint. No. 1 is a case of high degree constant converging squint; No. 2 is a case of intermittent converging squint; Nos. 3 and 4 are cases of diverging squint.

To those who have never used a tropometer as an aid in solving the pathological condition present in this class of cases, there remains a revelation in store, as conditions will stand forth with a clearness which cannot be adduced by any other method with which I am conversant.

Case I. V. B., age 13, referred to me in September, 1905. Convergence of left eye since two years old. Has simple hyperopia of + 1.25 dioptries in each eye, and with this correction vision was 20/20 with each eye. Could fix with either eye, but used the right eye constantly. I prescribed glasses to be worn constantly, with instructions to return occasionally for observation. In June, 1906, there being no improvement in the strabismic condition, I advised operation. *Version* showed an excursion of 55 degrees inward, 50 degrees outward for the right eye, which is normal, and 75 degrees inward, 20 degrees outward for the left eye. Measured by the perimeter the convergence was 32 degrees. I put a tuck in the external rectus and tenotomized the internal rectus of the left eye. The result was perfect and has remained so.

Let me quote the method given for dealing with such a case from three different text books, printed since I began practice in 1897. First: "If the vision of the squinting eye be fairly good, and the power of the external rectus sufficient, and if the squint be more than 20 degrees, it is advisable to divide the proceeding between the eyes. For example, if it be 30 degrees, about 20 degrees are corrected by tenotomy of the internal rectus of the squinting eye, and the remainder by tenotomy of the internal rectus of the fixing eye."

Second: "When operation is decided upon, it is a safe rule to divide only one internal rectus at a sitting. At the end of a few

weeks, if the squint still be considerable, the operation is performed on the other eye."

Third: "A simple tenotomy corrects a squint of about three or four millimeters. If the strabismic deflection is considerably greater than this amount, a second tenotomy must be performed in addition upon the other eye."

It was by following such advice in dealing with similar cases in my early years of practice that I was driven to despair, as the results obtained were not satisfactory. There is little doubt but that a normal internal rectus was sometimes tenotomized, while an abnormally weak external rectus muscle, which should have been shortened, was not touched. Bearing on the same question I shall quote from an editorial, "The Surgical Treatment of Squint," appearing in the *Ophthalmic Record*, January, 1906, page 15, as follows: "Not so many years ago, and even at the present time, we were advised, in a case of squint, to perform tenotomy on one of the interni—generally that of the squinting eye—if that did not produce parallelism, then tenotomy of the other eye, and so on ad infinitum until the optic axes became parallel, with or without binocular vision, as might happen. Then if an over-correction was produced, we were told, 'Well, operate and put it back.' The next step in our surgical procedure was to first stretch both interni, on the supposition that this would paralyze the action of these muscles, and then to perform a complete tenotomy on the same muscles, followed by a binocular bandage. . . . Other operators, at the same time, tell us not to do the double tenotomy, but to advance both externi, whereby we increase the motility of the eyes and in many cases will correct the squint without a tenotomy. . . . But all these procedures, as advanced by their exponents, in no way advise nor suggest anything in reference to what may be any special anatomic features of the case."

Case 2. Miss S., age 19, referred to me in June, 1907. Her occupation brings her before the public in vaudeville and light opera. At times she was chagrined by the consciousness that her left eye was converging, and for this condition she sought relief. Refraction revealed hypermetropia of $+ 3.25$ dioptries in each eye, with correction of which she had vision of 20/20 in the right eye and 20/40 in the left eye. Binocular vision was absent; could fix with other eye, and, on casual observation, visual axes appeared parallel. *Version* showed an excursion of 55 degrees inward, 45 degrees outward in the right eye, and 55 degrees inward, 40 degrees outward in the left eye. By wearing glasses

and thus relieving the accommodative effort, the patient was entirely free from the intermittent squint. In her vocation it was obviously impossible to do this. Two months after first observing the case I put a tuck in the tendon of the left external rectus. The operation has proven an entire success as the patient is not now annoyed as previously, and wears the glasses only for close work.

Case 3. A. R. F., age 41, first consulted me in August, 1904. Has + 0.50 dioptré hypermetropia in each eye. Vision 20/40 in the right eye, 20/20 in the left eye. Right eye slightly divergent. He returned in April, 1906, and requested that the right eye be straightened. Version showed an excursion of 25 degrees inward, 60 degrees outward, for the right eye, and 50 degrees inward, 45 degrees outward, for the left eye. In this case indications clearly pointed to giving the right internal rectus more power, which I did by the tucking operation. Knowing the tendency for a diverging eye to return to the original position after an operation to correct the deformity, I took the precaution to do a guarded tenotomy of the external rectus at the same time that I shortened the internal, the intention being to weaken the abduction while firm union was taking place in the internal. The result was perfect and has remained so.

Case 4. Miss S., age 25, consulted me in May, 1906. When a child the right eye was injured by a pin, producing a traumatic cataract, which was absorbed. The eye now diverges and has simple perception of light. The left eye has vision of 20/20. Version showed an excursion of 40 degrees inward, 60 degrees outward for the right eye, and 55 degrees inward, 50 degrees outward for the left eye. In this case I put a tuck in the right internal rectus and did a guarded tenotomy of the external. The result was perfect and has remained so.

A favorite author states in his book that, "In correcting a divergent strabismus a single tenotomy is hardly ever sufficient for this purpose; we must at least perform a tenotomy in both eyes, and generally an advancement as well." Another states that, "Operative measures depend entirely upon the degree of the deviation, the vision in the diverging eye, and the cause of the difficulty. When true divergent strabismus exists, it is usually necessary to perform an operation to correct it. This may be either tenotomy of one or both externi, or this operation may be combined with advancement of the internal rectus."

Cases 3 and 4 clearly indicate that had a tenotomy been done on the external of the other, or non-squinting eye, we would have

been interfering with a normal muscle, as in neither case did the external rectus show more than a normal dynamic condition.

It would be possible to cite many other cases, a study of which would augment the proof of the value of a tropometer in dealing with disturbances of the muscular balance of the eyes, but I close with the statement that of all the appliances with which I am conversant, used in studying the disturbances of the muscular balance of the eyes, none has rendered me more service and satisfaction than a tropometer. In fact, I consider its use in dealing with disturbances of the muscular balance as of equal value to the use of atropin in refraction, and no oculist will gainsay the value of the latter.

DISCUSSION.

DR. FRANCIS VALK, New York:—It has been my intention to present a paper to the profession on the use of the Tropometer in ophthalmology, and I am more than pleased to hear this excellent one by Dr. Lauder. For some time I have been greatly interested in the duction force or prism power of the eyes, and during the past few years my studies of the version power or fixation of the eyes has been somewhat of a revelation to me. But during this period I have also noticed that in many cases of heterophoria that these two very important functions did not agree. This I have endeavored to explain on the theory that the cases of esophoria and of exophoria may be complicated by a certain and peculiar tendency of the eyes to turn to the right or left. I have verified this in many examinations and have designated this condition as Dextrophoria or Laevophoria* respectively. It seems to me very important that we should recognize this tendency of both eyes to turn laterally as we do in the conditions known as Anaphoria and Kataphoria, where both eyes tend to turn up or down. Now this lateral tendency may influence the result of our operative procedures on the ocular muscles; or, it may make a very great difference which muscle we tenotomise or which we may advance in any case of heterophoria or in squint.

Let me illustrate this by a case of a young man with an esophoria of four degrees. I advised an operation, but the boy's father preferred that it should be done at home, so placed him under the care of the local oculist. An operation was performed and I have since learned that this boy's ocular condition was worse. Now his esophoria was complicated with a dextrophoria and the operation, tenotomy, was performed on the wrong eye.

If this theory is correct, there must be some method for the diagnosis of this condition, and from which we may find our indications for an operation on the ocular muscles. It seems to me that Dr. Lauder has pointed out to us the means for our diagnosis from his study of the motility of the eye in the examination of the duction sense, and particularly in his examination of the version by the use of the tropometer of Stevens.

Why should not the field of version be of special interest to an oculist? Many methods of measuring the rotation of the eye on its supposed center of rotation have been devised, but the great fault of all these methods, notably that of the well known arc of the perimeter, has failed

*See my paper before this society, 1905.

to correctly estimate the rotation of the optic axis inward or towards the nose. This is a great and serious fault which the tropometer completely overcomes. And, in my experience, it does accurately and scientifically measure the rotation of the optic axis in the field of version, upward, downward, inward and outward. These are the four principal movements of the eye, in which we are most vitally interested, and are so essential that I think no case of squint, either heterophoric or heterotropic, should be operated on until these important examinations have been noted and the indications fully considered. No other instrument can indicate the conditions of anaphoria, cataphoria or dextrophoria, and yet on a visit to one of the most prominent oculists of Europe I did not find one in his office.

I am therefore more than pleased that Dr. Lauder has presented this paper to the Academy, and I trust it will be of the same benefit to others as it has been to myself.

Now as to the findings of the tropometer, it does give us the actually correct indications for all our operations on the ocular muscles; yet it has been stated and published that squint, both convergent and divergent, are not due to a want of rotation, in other words, a deficiency of power, but simply and wholly due to a loss of the fusion force. This may be true in the hands of others, but I do not hesitate to assert that of several hundreds of examinations of the rotation, in all cases of squint I have always found a decided want of rotation, either inward or outward, according to the deviation. Furthermore, it is well known that certain cases of squint will show fairly good fusion force after a suitable operation, and when no special attempt has been made to develop this special function. I therefore doubt very much the assertion that all cases of squint are due to a loss of fusion force, when the same author asserts that all cases of heterophoria are due to a loss of muscular power. An inconsistent statement that seems to me might have been corrected by the use of the tropometer.

A few words as to the duction power in these conditions. We find fairly good power of duction in the cases of amblyopia without squint, and also following the correction of squint by an operation as I have stated. Before the operation for strabismus the prism test is useless; at the same time I consider it one of the most useful, if properly used, in heterophoria. In this connection there is one point that I would present for your consideration, and that is the estimation of the power of abduction, or, I might say, is the power of abduction always the same? I have not found it so, particularly in those cases where we find the condition which Noyes has called spasm of the interni, being always associated with esophoria. Here we may find the power of abduction equal to a prism divergence of six degrees, but if we estimate the power of abduction with the prisms, and then attempt to estimate that of abduction, we will find a decided change—the prism power of abduction having become very low. This condition is frequently shown in simple esophoria and will give an excellent result after the operation of shortening the externus by any of the various methods.

Two more points I would like to add after hearing this paper. When we compare, or, in other words, when we study the condition of duction and of version as to their finding in such number that these two functions are physiologically different; that is to say, that duction is the automatic function of the eye, controlled by the lower brain center, and that version is almost entirely voluntary, and is controlled by the higher brain centers. Consequently these two important functions, so closely related in the sense of sight, are yet practically separate, and consequently,

while we may expect and do find our predictions confirmed, one with the other, yet at the same time we must not be led astray, because we may, at times, find some contradictions in these important findings of duction and of version.

One point more, and this one is possibly of a personal interest. I note that Dr. Lauder speaks of placing a tuck or shortening in some of his operations. I am pleased to know that the doctor uses this method in his cases of heterophoria and of heterotropia; but at the present day I am aware that while there seems to be some doubt as to the original operator of the method, yet we have at least five different ways or methods by which the ocular muscle is shortened in its long axis. It is almost as hard as the Mary method of operating for senile cataract. Now would it not be more scientific if we designated what method was employed in these operations, as it seems to me it would be useful to know which is the more useful method. Is the use of the black silk, the use of catgut, or finally the use of the wire link lately placed before the profession?

EVOLUTION OF THE EYE MOVEMENTS AND THE GENESIS OF NYSTAGMUS.

ALEXANDER DUANE.

NEW YORK CITY.

1. THE REFLEX ARC FORMED BY THE SENSORI-MOTOR FIBERS CONNECTED WITH THE EYE.

It is a familiar fact that the left side of the brain enables us, first, to see, and to see with both eyes equally, an object which is situated on our right; and, second, to turn both eyes, so that each shall be directed equally to the right and point straight at the object of vision. Thus *in the case of the visual apparatus as in the other nervous mechanisms in the body, the left side of the brain puts us in relation, both sensory and motor, with objects situated on the right.*

In the case of the sensory fibers the relationship is affected by a peculiar arrangement of the end organs not found elsewhere in the body. Each side of the brain sends out a visual end-organ which bifurcates at its extremity. These two forked terminals overlap and partially fuse, the right fork (C'B', Fig. 1) of the left-brain terminal uniting with the right fork (Z'Y') of the right-brain terminal to form the right optic nerve and retina. The left halves of the right and left retinae thus really form one organ, the right halves another. These organs are physiologically distinct except at the macula, where it is probable that they are intimately blended, so that while the right side of the retina is thus connected solely with the right brain and the left side with the left brain, the macula is connected and equally so with both cerebral hemispheres.

Furthermore, it must be noted that, owing to the inversion of the rays of light in the refracting media of the eye, the forks B and B' of the left-brain terminal, which comprise the left half of the back portion of the eye, are in physiological relation with the segments A and A', which form the right half of the front of each eye. And A and A' may be called *lens terminal*, the lens terminal A belonging to B and the lens terminal A' to B.*

*A and A' are the true sensory end organs, B and B' being simply prolongations of the brain. In the case of the eye as of all sensory organs, there is a true and complete decussation and it takes place in A and A'; only here it is the impressing agent—i. e., the luminous rays—and not the impressed sensation that decussates. The partial decussation that takes place at the chiasm is not a true decussation at all, for the left-brain terminal B B' lies on the left of its fellow terminal Y Y' from the right brain, whereas if there were a true decussation it should lie to the right of it. In other words, if there were a true decussation the left tract would cross over and supply the right, instead of the left, half of each retina.

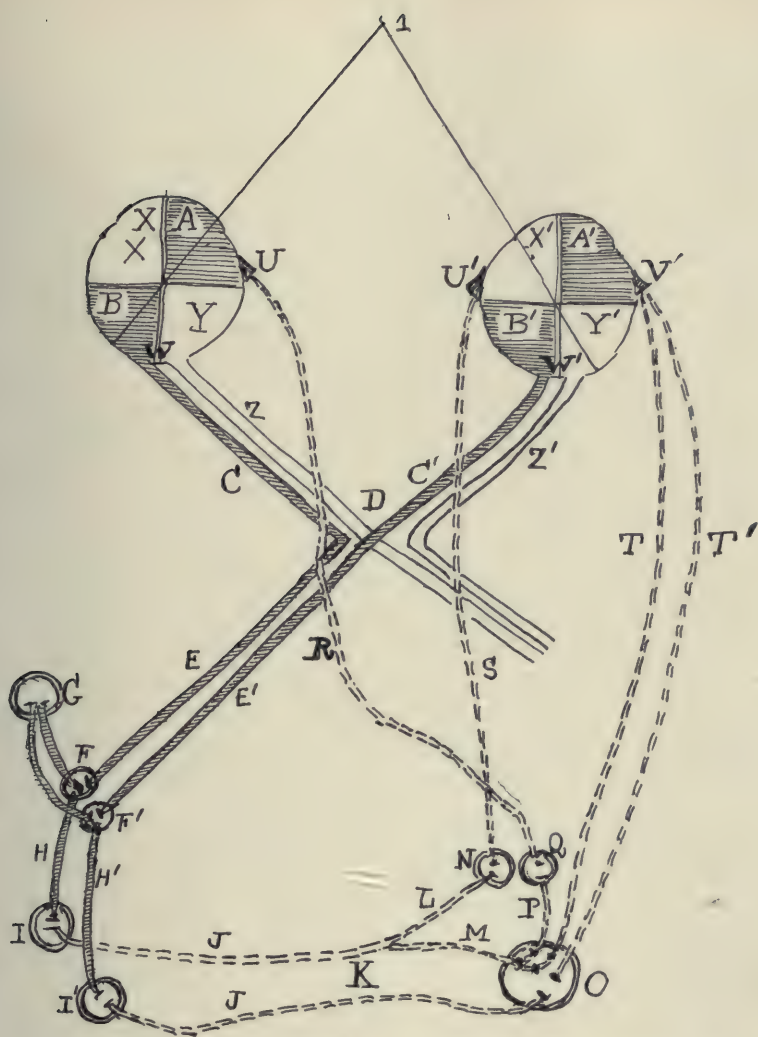


Fig. 1.

A, A', right-hand lens-terminals in physiological relation with B, B', the (right and left) left-brain terminals. C, C', prolongations of the left-brain terminals up through the right and left optic nerves. D, chiasm. E, E', prolongations of the left-brain terminals through the left optic tract and optic radiation. F, F', primary visual centers (in the occipital cortex) connected with E and E' respectively. G, higher visual center. H, luminous point near to eyes upon which they are stimulated to converge. I, I', reflex motor centers connected directly with F, F', and sending down the efferent tracts J and J'. (J conveys the reflex impulse emanating from the left eye, J' that emanating from the right eye). K, point (just beneath the aqueduct) where J and J' cross to the right side. J bifurcates to form L and M. L terminates in N (a subdivision of the oculomotor nucleus), whence it is continued through S (in the right abducens nerve) to the right internal rectus U'. M terminates in O, the abducens nucleus, and from there is continued partly along T in the right abducens nerve to the right external rectus V, partly along P (the posterior longitudinal fasciculus) to Q (a subdivision of the oculomotor nucleus) and thence through R (in the left oculomotor nerve) to the left internal rectus U. J' terminates in O, whence it is continued through T' in the right abducens nerve to the right external rectus, V. W, W', maculae luteae of left and right eyes. X, X', left-hand lens-terminals connected physiologically with Y, Y', the right-brain terminals. Z, Z', prolongations of Y, Y', through the left and right optic nerves. At the optic chiasm, D, they both cross over to the right optic tract. The right-brain terminal and its prolongations are denoted by the unshaded contours; the left-brain terminal and its prolongations to the cortex by shaded contours; the efferent prolongations from the left eye (left half of left-brain terminal) by unbroken black contours; the efferent prolongations from the right eye (right half of left-brain terminal) by the broken black contours.

In case of the efferent or motor fibers the precise course followed is not so well known and is probably more complex. Thanks to the researches of Bernheimer and other painstaking investigators, we know with reasonable certainty the course of the fibers from the abducens and the trochlear nuclei and from the different partial nuclei giving rise to the oculomotor nerves. We also know that these nuclei are interconnected by the posterior longitudinal fasciculus, and that the motor impulses to these nuclei are conveyed from the opposite side of the brain and probably from the opposite angular gyrus—the descending tracts crossing over just beneath the aqueduct. But the precise course taken by these descending tracts, the ramifications by which they are distributed to the nuclei, and the way in which they are connected with the efferent fibers are all more or less a matter of conjecture. The following hypothesis is put forth tentatively, because it seems to offer the simplest explanation for the evolution of the binocular movements and some of the perversions of these movements, such as nystagmus.

Light affecting the lens terminal A' produces a stimulus in the corresponding brain terminal B' which is conveyed along the right optic nerve C' and, after crossing the chiasm D, along a certain portion of E' of the left optic tract to a center F' in the left cuneus; and thence either to the higher visual center G or directly to the motor neurons I' in the angular gyrus. In the latter case, according to the hypothesis which I have framed, it now descends through the path J' (efferent portion of the reflex arc), crosses over to the other side at K, just beneath the aqueduct, and finally reaches the right abducens nucleus, O. From here it passes along T', the right abducens nerve, to the right externus, V', causing a contraction of the latter and turning the right eye or rather the lens terminal A' to the right.

Light affecting the lens terminal A produces a stimulus in B, which is conveyed through the left optic nerve, C, and then through a certain portion, E, of the left optic tract to neurons, F, in the left cuneus, and thence to the motor neurons, I, in the angular gyrus. From these it passes through the tract J, crosses to the other side at K, and then divides, one portion passing along the branch M to the right abducens nucleus O, the other through the branch L to the neurons N in the right oculomotor nucleus. The portion that goes to N passes (through S the direct fibers described by Bernheimer) into the right oculomotor nerve and through this to the right internal rectus U. The portion that goes to O probably supplies in part the right externus through

the branch T (lying in the right abducens nerve) in part passes through the posterior longitudinal bundle P to the neurons Q of the right oculomotor nucleus and thence cross over in the decussating fibers demonstrated by Bernheimer. Through these they reach the left oculomotor nerve R and ultimately supply the left internus U. Thus by this divided stimulus there is produced a simultaneous contraction of the right externus and of both interni, and the net result is that the left eye (or rather the lens terminal A) is turned to the right, the movements of the two muscles in the right eye neutralizing each other.

In other words, stimulation of the nasal half of the retina of one eye will, *if acting in a simply reflex way, move that eye alone and turn it temporarily, and stimulation of the temporal half will move that eye alone and turn it nasally.**

Light affecting the macula W will send up through the two optic tracts a bicerebral stimulus which will cause a contraction of both the externus and internus of the eye stimulated. Such a contraction of the two muscles will cause no movement but will simply keep the eye steady in the fixing position.

2. HOW FIXATION AND THE LATERAL MOVEMENTS OF THE EYES ARE DEVELOPED AND REGULATED BY REFLEX ACTION.

What are the advantages of this arrangement? The answer is that owing to it we learn, *first, how to fix with each eye accurately, and, second, how to move both eyes in perfect co-ordination.*

Suppose that a new-born infant whose eyes are directed approximately parallel, has suddenly presented to his notice a bright light on his right hand. This light impinging on both B and B', produces a sensory impulse, which is conveyed to F and F'. At this stage of the child's existence this impulse is scarcely conveyed to the higher visual center G, but flows directly into the motor neurons I and I'. The result, according to the hypothesis just stated, is a motor stimulus causing both eyes to move to the right. As they move the light sensation which set them moving gets more and more distinct, because the image of the light gets nearer and nearer the macula. Ultimately the eyes turn so far that the luminous image falls on the maculae W and W', and now, owing to the bi-cerebral connections of this region, a sensory impulse is sent up from each eye to both brain hemi-

*It need scarcely be pointed out that the reflex arc simply connects the brain terminal B with the corresponding lens terminal A; or rather, since the lens terminal A is the real end-organ, in which the stimuli originate, the reflex arc connects one portion of A with another.

spheres, and consequently a motor impulse is sent down from both. Hence, the original right hand movement of the two eyes, emanating from the left brain, is now checked by an equal left hand movement, emanating from the right brain. It is as if a brake had been put on as soon as the image fell upon the macula.

If, in spite of this check, the eyes move too far to the right, so as to shoot beyond the object, the image of the latter swings over past the macula and goes to lie on the right half of each retina (right-brain terminal Y Y'). Since the left-brain terminal is now no longer stimulated, the impulse that was causing both eyes to move to the right ceases and is replaced by an impulse which, as it emanates from the right brain, carries both eyes back to the left until the image in each again falls upon the macula. *Thus simply as result of reflex action each eye constantly tends automatically to assume the fixing position.*

At first it may take a number of oscillations to effect this, the eye repeatedly showing beyond the mark and coming back to it. But as time goes on constant practice renders the adjustment more and more precise, until finally it is performed with the utmost accuracy.

This constant practice not only makes each eye fix with precision, but *also makes the two eyes move accurately together.* For, if one eye moves faster than the other, it will arrive at the position of fixation first, when its progress will be automatically checked in the manner just shown. The other eye will still receive an impulse to move, because still only one of its brain terminals is stimulated. Presently it, too, will arrive at the position of fixation and will then also be checked. The two eyes will now both be fixing. This process of automatic adjustment, repeated over and over again, soon becomes a settled habit, *one eye, or rather one half terminal A, learning to move just as far and just as fast as its fellow half terminal A'.*

3. HOW THE MOVEMENTS OF CONVERGENCE AND DIVERGENCE ARE DEVELOPED BY REFLEX ACTION.

Movements of *convergence* are—at least in the beginning—initiated by a similar reflex mechanism. If an infant is looking off into space, and a bright object is suddenly placed near its eyes, the image of the object will fall on Y' on the right side of the right retina, and B, the left side of the left retina. The stimulus thus set up causes a contraction of the right and left internus, making both eyes automatically turn inward. Each will continue turning until the image falls upon its macula (W W')

when, just as both eyes are directed at the object, the movement is automatically checked. Here, again, just as in the case of parallel movements, the eye at first may fail to stop at the instant it gets into the fixing position; and again the two eyes may not arrive at the fixing position at the same time; but constant practice renders the adjustment more and more precise, until soon they are performed with absolute accuracy.

Movements of *divergence* are affected in a similar reflex way. If (Fig. 2) the eyes are already converged, a distant luminous object situated straight ahead will form its images on the

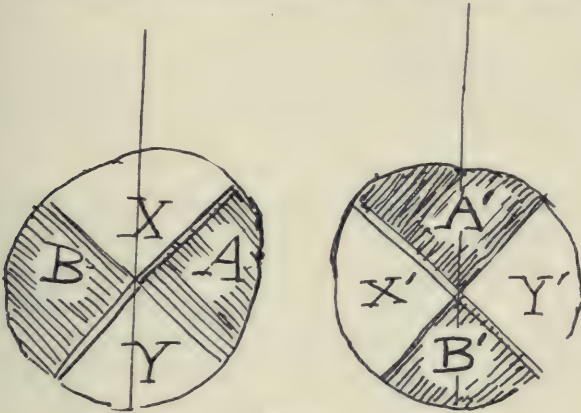


Fig. 2.

nasal half of each retina (Y and B'). This will set up a stimulus which ultimately produces an equal contraction of both external recti V and V', causing the two eyes to diverge until the image of the object arrives upon the macula in each eye (W and W'), when the movement will be checked.

4. FIXATION AND THE ASSOCIATED MOVEMENTS ARE SECONDARILY PRODUCED AND REGULATED BY CONSCIOUS PERCEPTION AND BY THE UNCONSCIOUS EFFORT TO OVERCOME DIPLOPIA.

It is in this way, I believe, that we learn to perform fixation with one eye and with both, and to move the two eyes together. That is, *at the outset the movements required to effect binocular fixation under all conditions are simply reflex and are the result of light stimuli acting on a peculiar sensory apparatus, which contains within itself a means of automatically checking the movement when the right eye has been secured.* These stimuli being constantly repeated render the corresponding reflex movements constantly more precise and more a matter of habit.

These reflex movements to the right or left may also be set up by tactile sensations or by sounds emanating from one side. But in the main they are evoked by light stimuli, and these alone serve to limit and regulate them.

Later on still another mechanism comes into play. After a child has had repeated practice in moving the eyes in this purely reflex way, the light stimulus striking the left half of either retina begins to impress him with the conscious idea of there being an object situated on the right. In other words, the sensory impulse now passes from F and F' not only directly to I and I', but also reaches the higher visual center G. *As a result of this conscious impression* a motor impulse will be sent down, causing both eyes to move to the right. That is, an impulse will be sent down from G to I and I' and thence along J and J' to the nuclei of the third and sixth nerves, and so on to the internus of the left eye and the externus of the right.

The eye movements that *result from conscious perception are always binocular*, i. e., both eyes move and to an equal extent. This is so even if the light stimulus that causes the movement affects but one eye. Thus a light stimulus affecting B' alone will, according to the interpretation that the mind puts upon it, cause either a movement of both eyes to the right or a convergence of both eyes. So also a light stimulus affecting B alone will cause either a movement of both eyes to the right or a divergence of both eyes.

On the other hand *reflex movements caused by a one-sided stimulus are themselves one-sided*. At least this seems to be the case during the earliest period of life, when the associated movements are in process of establishment and before they have become habitual. At this period a stimulus affecting B' alone is transmitted directly to F' (not reaching either G or F) and as it goes down by the way of J' causes simply a temporal movement of the right eye alone. So also a stimulus affecting only B is transmitted simply to F, and going down through J causes a nasal movement of the left eye alone.*

Once initiated, the conscious movements of the eyes not only *replace more and more the reflex movements*, but may act to neutralize them. Thus a light stimulus affecting B or B', instead of causing both eyes to move to the right (positive discharge of energy through J and J') may through an inhibiting discharge

*The reasons for supposing this to be the case are, first, that the evolution of convergence and divergence movements (see Section 3 ante) are better explained by this hypothesis than by any other; second, that this seems to be the only way of accounting for the fact that a one-sided congenital amblyopia may produce unilateral dissociated movements and perhaps a unilateral nystagmus. (See Section 5, infra).

sent down from G through the same channel cause both eyes to move to the left; i. e., the eyes, instead of seeking, may avoid the light.*

At the period when conscious perception develops, still another element comes into play to regulate and nicely adjust the eye movements. This consists in the *perception of diplopia* that now is evoked when the adjustment fails. That is, when the image in one eye falls on the macula, producing a bicerebral impulse, and the image in the other eye falls outside of the macula so as to stimulate but one side of the brain, the child becomes aware that there are two images. This begets a feeling of confusion which he unconsciously obviates by moving the eyes so as to bring the retinal images upon the macula in each eye. This, then, is another and extremely delicate regulating device which helps to keep the eyes properly directed.

5. PRIMARY PERVERSIONS OF FIXATION AND OF THE ASSOCIATED MOVEMENTS PRODUCED BY CONDITIONS WHICH PREVENT THE DEVELOPMENT OF THE NORMAL REFLEX ACTIONS.

According to the hypothesis here framed, fixation, both monocular and binocular, is in its inception dependent on the automatic checking of the eye movement that takes place when the image of the object looked for falls on the macula. This automatic action is doubtless greatly furthered by the fact that just in this region the nerve connections are very dense and numerous, so that the impressions received are peculiarly intense. It is also more readily performed, and fixation, therefore, is more readily acquired, if the optical apparatus of the eye is in a normal condition, so that the images formed by it are concentrated sharply on the macula and are not diffused over adjoining portions of the retina.

If, on the other hand, in a child just learning to see, the nerve connections at the macula are partially obliterated, or if, from opacities in the media or other optical defects, blurred and diffused images are cast on the retina, fixation is acquired with difficulty. In extreme cases of this sort (congenital blindness, congenital choroidal defects producing an absolute central scotoma) fixation will not be learned at all, and the eyes, moreover, will not move in association, but will wander aimlessly and each independent of the other (binocular dissociated movements). In

*This, of course, may happen not only if true light stimulus is consciously perceived as coming from a luminous object, i. e., if it reaches G, but also if, through retinal hyperaesthesia, it is so excessive as to be appreciated as a sensation of pain.

less marked cases of congenital defects—bilateral opacities of the cornea, congenital cataracts, etc.—producing impairment of sight in both eyes, the child learns how to make the various associated movements almost as well as if the eyes are normal. Fixation, too, is usually acquired, but is often performed imperfectly, and, instead of being a steady gaze, is accompanied by that peculiar tremor called *nystagmus*. This, I believe, is due to the fact that the image cast on the macula is so faint and diffused that, while it sends an impulse to the two sides of the brain as in the normal eye, this impulse is too feeble to produce the usual strong reflex discharge of motor energy, so that the eyes are not automatically checked as they are normally. The eyes, consequently, if they have already an impulse to move to the right, keep on moving until they overshoot the position of fixation and are directed decidedly to the right. Then their movement is automatically checked because now only the right side of the brain is stimulated, and they hence receive an impulse to move back to the left. In doing so, they overshoot the mark as before, and then return again to the right. Thus they oscillate back and forth about fixing position, and in this way there is produced that condition called congenital or optical nystagmus.*

These bilateral symmetrical oscillations constituting ordinary nystagmus are the usual results of congenital defects of vision affecting *both* eyes.

If *but one eye is poor-sighted from birth* various results may ensue. If B is connected simply with F and the path J, and B' with F' and J', and if, furthermore, there is no association of action between F and F', then stimuli originating in the left eye will be mainly expended in moving that eye, and if these stimuli are deficient, this eye alone will move imperfectly or irregularly.

This occasionally happens. Thus if the left eye has an absolute central defect, dating from birth, it will, in some cases at least, fail to move in association with the right, wandering in fact aimlessly about, while the right moves regularly and fixes with precision (unilateral dissociated movements). Occasionally, also, if one eye is poor-sighted from opacities in the media, etc., a *nystagmus* may develop which is confined to that eye.†

*It will be seen that this will occur from any condition that lessens the physiological preponderance of the macula over the other portions of the retina.

†It would seem, however, that even in this case the unilateral nystagmus may be bilateral to begin with. If this holds good for all cases, the presence of a unilateral nystagmus is no proof either of the primitive connection or lack of connection of the neurons F and F'.

Usually, however, the association in action between the motor neurons F and F' seems to be established very early, so that if the stimulus conveyed from one eye at least is normal, both eyes will learn to move properly. Hence, one-sided amblyopia is not usually accompanied either by dissociation of the eye movements or by nystagmus.

6. SECONDARY PERVERSIONS OF FIXATION AND THE ASSOCIATED MOVEMENTS.

While these cases of one-sided amblyopia are usually free from pure muscular anomalies of this sort, they are often subsequently affected with *squint*, the eye which has the poor sight deviating. But true squint* does not develop during the formative period, when the child is learning to move the eyes and to fix. It sets in at a much later period, when the functions of fixation and associated movement have become firmly established. It may be called, therefore, a *secondary perversion of motor action*. The deviations which do occur in an infant's eyes—the *primary perversions of motor action*—are either temporary, the result simply of irregular coördinate movements, which are soon regulated and rendered uniform by the checking process already described; or, as in the cases just cited, they are occasionally permanent, being due, then, to some abnormality which allows the irregular coördination to persist and become habitual.

*Exception is, of course made, of congenital paralytic or spastic deviations.

THE RECOGNITION AND MEASUREMENT OF LOW DEGREES OF NYSTAGMUS.

EDWARD JACKSON, M.D.

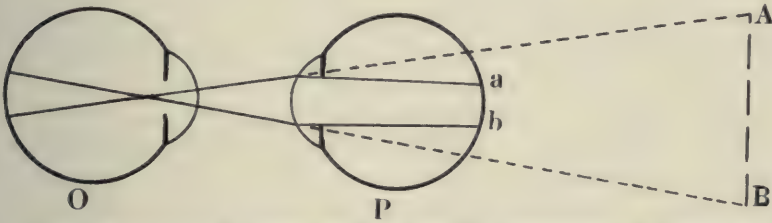
DENVER, COLO.

High degrees of nystagmus are noted by family and friends, and on account of the movements many patients comes to seek relief. Pronounced excursions of the eyeball, 2 mm. or upward, can be measured with sufficient accuracy by holding a rule in front of the eye, or noting the movement of the eye with reference to the reflex from a fixed light. Low degrees of nystagmus, excursions of 1 mm. or less, are more difficult to measure, and sometimes it is not easy by ordinary examination to decide whether or not nystagmus is present. Nystagmus of low degree is probably more frequent than nystagmus of high degree, and is of equally important significance.

Most ophthalmologists have observed, while making the ophthalmoscopic examination, low degrees of nystagmus that have not before been noted. Direct ophthalmoscopy, in which we watch the highly magnified image of the ocular fundus, will furnish a simple and sufficiently exact method for measuring the extent of the nystagmic movements.

In looking at the erect ophthalmoscopic image, if the eye of the surgeon be placed close enough to the eye of the patient, one may see the area of the optic disk and a certain portion of the surrounding fundus. As the surgeon withdraws his eye farther from that of the patient the visible fundus area diminishes; and at a certain distance from the patient's eye the image of the optic disk appears to occupy the whole area of the pupil. Farther away only a portion of the disk can be seen. At the distance between surgeon and patient where the image of the disk just fills the pupil, the pupil area presents a portion of the fundus image corresponding to a definite area of the retina, a circle about 1.5 mm. in diameter, the usual diameter of the optic disk. The movement of any given point across this space indicates an extent of movement in the eyeball that can instantly be known with practical accuracy, or calculated with still more minute exactness, if this be desired.

Under these conditions if the movement were wholly in the ocular fundus the actual displacement of a point moving across the pupil would equal the diameter of the optic disk, 1.5 mm. But while the fundus moves in one direction the pupil moves in the opposite direction, so that the actual movement is only a fraction of 1.5 mm. Take the case of an emmetropic eye having a pupil 6 mm. in diameter. Conceive the fundus image (as do Snel-len and Landolt, *Traite Complète d'Ophthalmologie*, De Wecker and Landolt, Vol. I, p. 800) projected on a plane 30 cm. behind the nodal point of the observed eye, and therefore magnified 20 diameters. The image of the optic disk will be $1.5 \times 20 = 30$ mm. in diameter. In order that the 6 mm. pupil shall be projected



Relations of eyes of surgeon and patient for measurement of nystagmus. O, eye of surgeon. P, eye of patient. a b, the part of the fundus visible in the pupil. A B, part of enlarged fundus image corresponding to a b, and to the projection of the pupil.

of the same size, 30 mm., upon the same plane, it must be $6/30 = 1/5$, the distance of the plane of projection from the observer's eye. Disregarding the distance (4 mm.) between the plane of the pupil and the nodal point of the patient's eye, the distance of the pupil from the plane of projection, 30 cm., will be the other $4/5$ of the distance of the surgeon's eye from the plane of projection. Hence the distance of the surgeon's eye must be one-fourth of 30 cm., or 7.5 cm., or 3 inches.

Viewing the erect ophthalmoscopic image of the fundus from this distance, an actual movement of a point on the retina equal to 1.5 mm., the diameter of the disk, would cause such a point to appear to move across the width of the pupil, if the pupil remained stationary. Or, a movement of the pupil equal to its own diameter would cause a point in the fundus to appear to move across the width of the pupil, assuming that such point remained stationary. In nystagmus both the fundus and the pupil are displaced. The apparent movement of a point across the pupil is the effect of the actual movement of a point plus the effect of the actual movement of the pupil.

The pupil and the ocular fundus move about the center of rotation of the eyeball, which for practical purposes lies half-way between them. Hence the actual movements of the fundus and the edge of the pupil are practically equal. But the movement of the fundus at 1.5 mm. under the conditions assumed, produces just as much effect in the apparent displacement of its image as does the movement of the pupillary margin, the whole diameter of the pupil. Taking the case assumed above 1.5 mm. movement of the fundus produces the same effect as 6 mm. movement of the pupillary margin. Since the actual movement of the two points is the same, the share that each produces in the apparent movement of a given point across the pupil is inversely as these distances. That is, the apparent movement produced by fundus displacement, is to the apparent movement produced by pupil displacement, as the diameter of the pupil is to the diameter of the optic disk. In the above case of a pupil of 6 mm. in diameter the relative size of pupil and optic disk are 6 : 1.5 or 4 to 1. If the total apparent movement across the pupil be represented by 5, four-fifths of this is due to movement of the fundus and one-fifth to movement of the pupil. Table I, based upon the assumption that the eye is emmetropic and the diameter of the optic disk 1.5 mm., gives in column one different diameters of the pupil; in column two the distance of the surgeon's eye (nodal point) from the patient's pupil; in column three the percentage of actual displacement for the point in the fundus as compared with its movement across the pupil; and in column four the actual movement in millimeters of a point of the fundus that seems to move across the pupil.

TABLE I.
Pupil including area the diameter of the optic disk.

Pupil.	Bet. eyes.	Percentage.	Actual movement.
2 mm.	21 mm.	.57	0.85 mm.
3 mm.	33 mm.	.67	1. mm.
4 mm.	46 mm.	.73	1.1 mm.
5 mm.	60 mm.	.77	1.15 mm.
6 mm.	75 mm.	.80	1.20 mm.
7 mm.	91 mm.	.82	1.23 mm.
8 mm.	109 mm.	.84	1.26 mm.
9 mm.	128 mm.	.85	1.28 mm.

If a given point of the fundus image moves just the apparent width of the pupil the actual movement of the eye is indicated in column four of the table. If it moves only a fraction of this distance, a similar fraction of the number of mm. given in column four of the table represents the real movement. For instance, with a pupil 3 mm. in diameter, the point of the fundus appears

to move $\frac{1}{4}$ of the way across the pupil, the actual movement is only one-fourth of one millimeter.

This method is also capable of modification so as to measure higher degrees of nystagmus. By bringing the surgeon's eye closer to the eye of the patient, a portion of the fundus having a diameter twice that of the optic disk can be brought into view, and in this way oscillations of greater amplitude can be measured. Table II gives the same data as Table I, but for the pupil projected on the plane of the fundus image so as to correspond to a portion of the fundus 3 mm. in diameter.

TABLE II.

Pupil.	Bet. Eyes.	Percentage.	Actual Movement.
2 mm.	10 mm.	.40	1.2 mm.
3 mm.	16 mm.	.50	1.5 mm.
4 mm.	21 mm.	.57	1.71 mm.
5 mm.	27 mm.	.62	1.86 mm.
6 mm.	33 mm.	.67	2. mm.
7 mm.	40 mm.	.70	2.10 mm.
8 mm.	46 mm.	.73	2.19 mm.
9 mm.	53 mm.	.75	2.25 mm.

For practical purposes it is sufficient to remember that with the pupil projected on the plane of the fundus image, with a fundus area of 1.5 mm. diameter, the actual displacement causing a given point to move across the pupil varies from 1 mm. with a small pupil to 1.25 mm. with the pupil widely dilated. With the surgeon's eye brought closer to render visible a 3 mm. area of the fundus the actual movement which appears to carry the point across the pupil varies with the size of the pupil from 1.5 to 2.25 mm.

In addition to the actual diameters of the optic disk and pupil, it is evident that the relations of apparent with actual movement will be influenced by the refraction of the eye, whether the ametropia is axial or curvature ametropia, the lens used to secure a clear fundus image, and its position between the observed point and the eye of the observer. These all influence the enlargement of the fundus image. Elaborate calculations based upon the refraction of the eye and the extent to which the ametropia is axial, or is ametropia of curvature, might give the exact value of the apparent fundus movement in each case. But the simple and practical method is to make the observation with correcting lenses placed before the patient's eye at its anterior focal point. Such lenses reduce the problem in any case to that of simple emmetropia, and permit us to deduce the actual rotation of the eye by the methods above indicated.

The above applies to all rotations made about the axes perpendicular to the antero-posterior axis of the eyeball, as in lateral or vertical nystagmus. For the rotations around the antero-posterior axis, rotary nystagmus, we also have in the optic disk an available test. The disk may be taken as a circle the rotation of which around the antero-posterior axis of the eyeball may be compared with any fixed meridian. The disk would serve better if the antero-posterior axis pierced its center. With a dilated pupil vessels converging to the macula may be used in place of those diverging from the center of the disk to estimate the rotation about the antero-posterior axis. These observations on rotary nystagmus do not require that the observer should place his eye at any particular distance from the eye of the patient. The angular movement in a plane perpendicular to the line of sight can be observed from any convenient distance.

Briefly the method of observing nystagmus here described consists in noting the character of the movements executed by definite structures in the ocular fundus as seen in the erect ophthalmoscopic image. Withdrawing the observer's eye until the optic disk appears to occupy the whole of the pupil one observes the apparent extent of the movements, whether a given vessel appears to pass entirely across the width of the pupil with each excursion of the eyeball, or only one-half or one-fourth of that distance. From this, by brief calculations, or from the table given above, the real extent of lateral or vertical movement is to be deduced. Perhaps it is not necessary that all cases of nystagmus shall have the extent of movement exactly measured. Yet this can properly be required for cases reported to take their place in the literature of the subject; and it will be found very satisfactory, in attempting to judge by the extent of the movements as to the progress of any case under treatment.

DISCUSSION.

DR. SCHNEIDEMAN, Philadelphia:—There has heretofore been no exact method of estimating the degree of nystagmus, nothing other than an approximate linear estimate in millimeters; so there is little to be said about Dr. Jackson's scheme except that it is a first-class idea, new and answers the purpose. In this connection we may refer to Javal's method of estimating the number of jerks of the eye in reading a line by a microphone. Thorner has done the same with his ophthalmoscope. A right-angled prism is placed before one eye and the subject under examination reads, by means of the prism, type lying on a horizontal plane. The observer notes through the ophthalmoscope the number of movements or jerks undergone by the fundus of the other eye. It might be possible also to apply the same or a similar method to measuring the movements of nystagmus.

DR. PERCY FRIDENBERG:—I think we are greatly indebted to Dr. Duane for his painstaking neurological statement of the evolution of the eye movements. This is a complicated question and increasingly important, as the otologists are recognizing and studying the occurrence of nystagmus in otitic disease, and if the ocular symptoms are to be of any value to them, they must have an understanding of what the normal movements intend, and what these movements represent as far as the brain control and involvement is concerned. When we read of the nystagmus toward the diseased side or away from it, increased this way and that, and so on, we are so confused that we are very soon at sea. The same thing applies to the nomenclature of nystagmus. Dr. Duane has taken up one form of nystagmus, the visual type, which has been called oscillatory nystagmus. There are seven or eight terms applied to this disturbance of motility, and none is accurate, because the ideas overlap. Thus we have congenital and acquired, visual and fixational, spastic and paretic, ocular and labyrinthine nystagmus, and other pseudo-antitheses. No one has undertaken to find out whether it is absolutely congenital or not, and lesions interfering with vision and development of fixation may be caused *intra partum*. It is a question if any child is born with nystagmus. This anomaly develops in an attempt at fixation. The acquired form may be due to brain disease and of an entirely different character. I want to call attention to the fact that the otitic or cerebellar form is a fixation twitch, the other a fixation tremor. The resulting inaccuracy in central fixation is due to the purely ocular form, whereas in the otitic form there is an evident directional element, and it is a recognition of the direction that we use in the otitic cases, as fixing the form and character of the motion. When we recognize the direction in the otitic nystagmus we will be led to a correct diagnosis. The oscillational character which Dr. Duane analyzed I have attempted to describe by analogy with reversion to a lower type, a sort of functional atavism. We find it in lower types of development. The lower the form of animal the less marked the difference between action and rest. I simply call your attention to the constant fibrillary motion of the epithelium which persists in the higher grades of the animal kingdom, the weaving motion of pseudopods and primitive eyes, and tentacles. The same thing, in the child, a sort of groping with the eye, while in a trained eye fixation is effected by a single effort. Another thing, in the study of the otitic nystagmus we note a slow and a rapid motion. In the fixation clonus there is a rapid motion of aiming (*Einstellung*). This is the directional effort toward the apparent source of moving objects. The other is a slow motion back again which follows an apparent motion of objects in space. The subject is complicated and of increasing importance clinically and scientifically.

DR. WENDELL REBER, Philadelphia:—There is a practical suggestion to which I would like to call your attention, and that is a very easy although gross means of estimating a nystagmus by means of the ordinary ophthalmometer. A suitable scale, such as is used in the tropometer, would make it easy to tell whether one is dealing with a fibrillary tremor or a clonus. It could be easily shown. A distinguished neurologist friend of mine once sent back a case saying there was no nystagmus, but I insisted there was a fine tremor. Finally I showed it to him with the ophthalmometer and the gentleman was convinced.

DR. LUCIEN HOWE:—We have been accustomed to say, "That is nystagmus" and think no more about it; but we are really beginning to get a little light on this subject. Special attention has been given to the subject in the past few years by the Vienna school, especially as shown

in the careful studies published by Branay. He shows that in the majority of healthy persons we can produce nystagmic movements by repeated rotation of the individual. He uses a sort of office chair to demonstrate this. I tried that with several subjects seated in an ordinary revolving chair, but was not able to see any satisfactory results. By placing a young subject in a swing, however, then twisting the rope and allowing it to untwist rapidly, it was possible to see an oscillating movement of the eyes. Perhaps simple experiments of this kind may give us a basis for a study of pathological conditions.

DR. SAVAGE, Nashville, Tenn.:—I have an idea that lateral nystagmus means the external recti muscles are too loose. I have been shortening these muscles and I am sure I have obtained some good results. In vertical nystagmus I think the superior rectus of one eye and inferior of the other are too long and flabby, and I have undertaken to correct them by shortening. An old soldier who had had a part of the bone of the arm resected had a jerking movement when trying to use that hand. The muscles of the arm were too long for the little bone he had in it.

DR. DUANE (closing):—I wish to emphasize the point that this hypothesis applies to only one form of nystagmus—the so-called congenital or optical form. There are many forms, and this theory does not apply to the otogenoid or the late acquired forms due to nervous troubles, like multiple sclerosis, etc. While the hypothesis was evolved by me some six or seven year ago, it is but simple justice to say that a similar idea as to the genesis of nystagmus is, I think, held by Wilbrand, and, I believe, is buried somewhere in his monumental *Neurologie des Auges*; but though I have searched for it there, I have been unable to find it.

THE SURGICAL TREATMENT OF STRABISMUS.

HOWARD F. HANSELL, M.D.

PHILADELPHIA.

The propriety of operating and the choice of operation in cases of manifest strabismus demand knowledge: 1, of the cause; 2, of the complications; and 3, of the degree. It is assumed as a necessary preliminary in all cases that the visual power and refraction are known and that non-operative measures have failed to coördinate the eyes. In this paper functional squint only is considered, and paralytic deviations and those due to visible organic changes in the media and retina are excluded. The subject is thus narrowed to a consideration of the common cases of internal squint of hypermetropia and the external squint of myopia.

1. HYPERMETROPIC INTERNAL SQUINT.

A large proportion, probably 90 per cent, of the cases of internal squint are hypermetropic. Donder's theory, announced fifty years ago and practically unmodified since, of the relation of accommodation and convergence, is an entirely satisfactory explanation. Relative accommodation and convergence or the loss or modification of the independent action of the two functions may serve to explain in part the reason why all hypermetropes do not squint or why internal squint is present in some cases of emmetropia and myopia. The instability or undue susceptibility of the nervous system to influences of heredity or environment as an etiologic factor is undoubted. Whatever may be the true inwardness of internal squint, it is, in its incipency, unquestionably a functional affection to be cured by continued therapeutic paralysis of accommodation, and by restoring the normal balance between accommodation and convergence by the use of convex lenses. But after the period of functional imbalance has passed, at about the sixth year of life, although the limit is subject to individual variations and organic changes in the brain centers, in the ocular nerves or in the ocular muscles have set in, upon the nature of these changes depends the character of the surgical measure to be resorted to.

The atrophy of the brain cells in the fusion center or the loss of conductivity of the nerve fibers from the center to the termination in the muscles is problematic, and does not concern us

in those cases capable of cure by operation. Our sphere of operation embraces the muscles only. If excessive use of the accommodation enforces excessive use of convergence and disruption of the coördination of both, there must be either stimulation of the third nerve or loss of function of the sixth, with corresponding increase of muscular response (power) of the interni and loss of muscular response (power) of the externi, or both. If the former, tenotomy of one or both interni is indicated; if the latter, advancement or resection of the externi. In accordance with Donder's theory, tenotomy is the proper procedure, and this operation has long been the popular one. Many cures have resulted and also many failures to cure. The causes for the failures have not always been those of technique. Operations carefully done by experienced men have been ineffective, even in cases of good vision in each eye. The blame has been laid on the absence of the fusion sense or loss of fusion power, and perhaps justly. *The cause of the success is the mechanical adjustment of the mechanical insertions by which the balance of power has been equalized in a patient in whom the fusion power has been preserved.* Tenotomy in high grades of esotropia cannot be expected to bring about adjustment, at least permanently, because graduated section or even tenotomy of the entire tendon, with preservation of the secondary insertions, will give an under correction and a complete division of one or both interni will almost surely lead to divergence after some months have elapsed. We have all seen too many cases of this kind. Measurements of the degree of convergence do not give identical results, whether they are made by the perimeter or by the prismatic estimation of the distance separating the false from the true image, but slight deviations are not important factors in the determination of the operative method.

My experience leads me to believe that the careful division of the whole tendon at its insertion, without interference with the secondary attachments, is efficacious when the deviation is 25 degrees or less. *The operation of former times, the division of all the connecting fibers as well as the tendon, should not be undertaken in any case.* For degrees higher than 25 degrees, double externus rectus advancement has been the operation that has proven most successful in my hands, and of all the procedures that I have tried, that proposed by Wootten is the most satisfactory. For details of the operation I refer to his original paper. Several modifications of inserting and tying the sutures have been proposed, and while some have the advantage of easier with-

drawal of the threads, the advantage is more theoretic than real, for the threads may remain indefinitely and should be removed only when they become loose or are creating inflammation.

In deciding upon operation the factors to be considered are: Is shortening of the externi superior in its results to lengthening of the interni; and, should we add to the strength of the weak or lessen the power of the strong? If tenotomy is based on the proper principle and is efficacious in curing esophoria and low grades of esotropia, it seems logical to apply the same method to all grades irrespective of their degree. The objection to this reasoning is suggested by experience and sustained in a measure at least by theory.

In the case in which either eye may be used for fixation, the eye used depending more upon accident than design, any operation conservatively done which will bring the visual lines approximately parallel, and will pave the way for binocular vision, a result finally accomplished and retained only by the centers in the brain through the ocular nerves. It should be borne in mind that the fault is not with the muscles themselves which, in the beginning, are neither too weak nor too strong. We can attain our ends by muscular operations only because we bring the images of the two eyes within a merging distance of each other. By mechanically changing the position of the retinal image nearer to the fovea, we compel the brain to abandon its former practice of monocular vision and to substitute for it the unaccustomed exercise of its fusion power. It is possible that the proximity of the images to each other creates a power of fusion in some individuals; certainly it stimulates and develops it. By admitting this supposition we are able to harmonize our conflicting ideas and experiences and to understand how tenotomy may be the proper method in certain patients and advancement in others, and how unskillfully performed operations of either kind must be unsuccessful.

The third nerve theory, based on the relation of accommodation to convergence, is correct, but treatment based on it is sometimes wrong. Too much accommodation means too much convergence—equivalent to saying convergence is too strong and to cure it tenotomy is proper. The fact is that convergence is overstimulated while the muscles of convergence are of normal strength. Abduction is weakened but the externi are as strong as ever. Restoration of coördination is the cure. This is accomplished in early life by atropia and glasses, and later only by bringing the factors into closer relation, so that by exercise and development of mental power, coördination may re-establish itself. For these

reasons I have abandoned tenotomy in high grades of strabismus and perform only Wootten's operation of advancement. The relative position of the eyes during the first few days after operation is rather suggestive of failure the improvement is so slight, and one feels as though tenotomy should be immediately performed before the healing is complete. It is essential that both eyes should be bandaged for four days, the bandage removed once daily, only for the purpose of cleansing the eyes. Subsequently, under atropia or glasses, the visual lines slowly become parallel. The conjunctival sutures may be removed at the end of a week, the deep sutures allowed to remain for weeks or months. This operation is to be recommended provided: 1, the squint is concomitant; 2, that it exceeds 25 degrees; 3, that the technique is closely followed; and, 4, the eyes are bandaged for four days. The only failure I have met with in the past two years was in a young man in whom either the operation was not well performed or the suture became detached. In one case it succeeded after a tenotomy, made three years previously by a capable operator, had signally failed.

In the other case of hypermetropic strabismus, namely, that in which amblyopia of one eye is present, the Wootten operation has not been in my hands successful. In these cases we are dealing with an entirely different proposition. *We operate to cure the deformity, because we have given up the hope of the acquisition of binocular vision. The fusion center cannot be stimulated by the closer relation of the two images because the brain refuses to recognize the image of the amblyopic eye. The union of that blurred image with the other means confusion, so there is nothing to be gained by it.* The theories applicable to concomitant squint do not hold. Originally the amblyopia was as great a factor as the hypermetropia in causing the squint, and unless both causes can be removed we cannot hope to cure on the same lines of treatment. If the amblyopia can be cured, the case will be brought into the category of concomitant squint and treated accordingly. The operation to be preferred in the amblyopic cases are, for the high grades, advancement of both externi and tenotomy of internus of squinting eye; for the lower grades, advancement of externus and tenotomy of internus, both confined to the squinting eye.

MYOPIC EXTERNAL SQUINT.

Confirmation of the theory elucidating the reasons for strengthening the weakness in preference to lessening the strength of the

apparently too powerful muscular combination, is furnished by the history of the development of the external squint of high myopia or uncorrected moderate or low myopia. No claim has been made or can justly be made that the common form of functional divergence is the result of excessive power of abduction or of a gain in the individual strength of the external recti muscles. With loss of accommodation and the mechanical obstacles to convergence incident to the lengthened eyeball, adduction is diminished and lost and abduction becomes relatively greater. The power of rotation of each eye is preserved and the muscular structure remains unchanged until from disuse and the habit of turning the head to relieve the overburdened interni, the muscles atrophy. The methods of determining the arcs of rotation, as Howe terms them, furnish little or no reliable information as to the functions of divergence or convergence, and cannot safely be used as the guides in the decision as to the nature of the operation. The perimeter measurements, while probably as accurate as those of other instruments, will define the degrees of rotation and their limitations, but we learn only the relative value. Strabismus eyes are, as a rule, capable of full rotation, because the muscles are not faulty. Moreover, should we learn that the inward rotation is inferior in its arc to that of the outward rotation, we are not justified for this reason alone in concluding that the abduction is too strong and should be reduced by tenotomy of the externi; nor, on the other hand, that adduction is structurally weak, and that advancement of the interni is the proper operation.

In considering the etiology, and therefore the treatment, of myopic external squint, we must go deeper than the eyes, and study, if we can, the real sources of the loss of coördination. If high myopia is the cause, the defect is deficient convergence, not relative, but actual, in the presence, probably, of full muscular strength of each internal rectus or the average degree of inward rotation when the eyes are tested separately. External tenotomy, single or double, will increase temporarily, and if the operation is extensive, permanently, the inward arc, by laming or destroying the outward arc, and although the patient may be able to use his eyes better at the reading distance because the cornea has been mechanically turned inward, the power of convergence is not increased thereby.

Binocular vision at 14 inches means, as a result of tenotomy, homonymous diplopia outside of that distance. With the correction of the optical defect, giving both eyes approximately equal

vision, convergence may be restored and maintained by double advancement, provided the images are thus artificially brought near enough to each other to stimulate to action the natural forces of fusion.

Convergence and divergence are extremely complicated functions. The more we have to do with them and their arrangements the greater is our respect. We speak as though we had to deal with external and internal recti only and sometimes forget that every movement of the eyeballs concerns the stimulation and inhibition of antagonistic groups of muscles controlled by a complicated nervous apparatus, the intricacies of which no physiologist has been able to fathom.

DISCUSSION.

DR. SAVAGE, Nashville:—Allow me to call your attention to what is absolutely a fact, though some seem to doubt. There is a center of convergence and there is a center of control of the ciliary muscles. I have named the convergent center the third cortical and I have named the ciliary muscle center the tenth cortical. There is unquestionably an intimate relationship between these two centers, and I do not see how it can be denied. If there is a certain degree of activity on the part of the tenth center, there is a corresponding degree of activity of the third center in control of the interni. This is an explanation of hyperopia as a cause of internal squint. It is easy to understand that when there is any quantity of hyperopia, there must be a discharge from the tenth center, for focusing parallel rays, and when this discharges its neurocity, the third center discharges a like amount to the interni. This would make the eyes cross, except for centers standing guard at the base of the brain to prevent. These basal centers act on the externi. The work is so hard in some cases (cases of intrinsic esophoria) that the basal centers give up the work, and whenever this occurs, there is a squint. There can be no case of squint without inharmonious muscles—muscles differing in tonicity.

One thing we should determine in every patient: Is the vision equally good, or nearly so, in the two eyes? If it is, go slow. Whenever there is no amblyopia in a squinting eye, it is impossible to make the two work together. It is often better not to operate when the vision is equal in the two eyes. You can relieve the cosmetic effect greatly without double vision, but if you try to make them absolutely straight, you get double vision. If one eye is blind I can get them straight and restore vision in the blind eye. If in any case of squint there is equal vision in the two eyes, I am very unhappy. The macula in the one is not in harmony with the macula in the other. There is faulty brain connection.

When we are operating on a case of squint or a case of heterophoria, we should not fail to ask the question, "What is the relation of the vertical axis with the median plane of the head?" If wanting in parallelism, you should know how to act. If it is a case of esotropia or esophoria, with no cyclophoria, then the rotation plane of the muscle must not be changed. You must change the plane of rotation if there is cyclophoria complicating the other condition. This is done by making correct marginal tenotomies. I simply want to warn you on these two points. Valk says do not operate on an inferior rectus muscle. I say, not unless

you have to. If the hyperphoria is not corrected by operation on the superior rectus, turn to the inferior rectus of the cataphoric eye. It is as easy to operate on as is the superior.

DR. LUCIEN HOWE, Buffalo, N. Y.:—To correct a misapprehension with regard to the equipment in Buffalo, I wish to say first that I know of one office where one Stevens tropometer, and even a second one, is used. We have also found that one can take off the box, and using the tube as a simple telescope, view the movements of the eye quite as satisfactorily.

Again, we are falling into the error in this discussion of considering strabismus as a disease. We all know it is a symptom. The important question is, of what is it a symptom? Is the lesion an anatomical fault in the muscles? Such a condition would answer Dr. Valk's question and account for a convergence with myopia. But Donder's classical explanation applies to another and a large group of cases.

We talk quite readily about anatomical conditions, but we can count on our fingers the dissections which have been made on eyes, in which strabismus did exist. We must get at the bottom facts from the standpoint of anatomy. We should find by dissection first what is the normal condition, and then the abnormal.

DR. WENDELL REBER, Philadelphia:—First, I want to endorse very enthusiastically the things Dr. Howe has just said, and second, I want to signify the pleasure I always have in taking part in one of these muscle discussions. It is only by a perfectly outspoken expression of each individual viewpoint that we will eventually come somewhere near the truth. Concerning convergent strabismus, I think it wise to divide these cases into congenital and developmental. Among the congenital would be included palsies or pareses of the external recti, and also those conditions due to obstetrical injury. Wolff and von Sicherer have both conclusively shown the frequency of retinal hemorrhages after instrumental delivery of the child, and this will easily account for the amblyopic non-squinting as well as squinting eyes, without ophthalmoscopic change, that we see from time to time. The tropometer is certainly of assistance in recognizing congenital palsies or pareses. I think it equally valuable to have the patient follow a tiny electric light along the arc of the perimeter.

Most prominent among the developmental cases are those exhibiting lack of development of the fusion faculty. These fall into three classes: Class one, the practically emmetropic child, with little or no fusion faculty. Class two in these classes is the other extreme type, in which there is a perfect fusion faculty but an almost insurmountable refraction error, the pure accommodation squint of Donders. Class three presents a combination of these two factors, an absent or imperfectly developed vision faculty, combined with a high grade unequal refraction error. Thus we have embarrassment of both the cortical and peripheral ends of the visual apparatus. In my opinion, this class comprises about 80 per cent of the cases of convergent strabismus in childhood that come before us.

Concerning the relative merits of advancement and tenotomy, anything that increases the grasp of the muscular cone on the eyeball is to be desired, and I find myself doing more advancements every year. They are much easier to do after they have been done a few times. Tenotomy is dangerous; first, in that it is easy; and, second, that one never knows what the final ultimate result will be. Wooten's method is good; Worth's method is good, especially if slightly moderated; but after all it matters very little what advancement operation is done, so long as it is done well. A bandage for at least three days is absolutely imperative. Once in a great

while I secure full binocular vision after operation on alternating squint. But such an issue, I think, is reasonably rare, and it seems to make precious little difference to the patient.

DR. HANSELL (closing) :—The remarks of Dr. Valk apply only to the exceptional cases of squint. I have purposely omitted a discussion of other than the treatment of the usual internal squint of hyperopia and the external squint of myopia. The exceptional cases due to injury at birth, hemorrhage into the retina, deformity of the skull and unknown causes, do not, in my opinion, conflict with the well proven Donders theory. On the contrary, they seem to strengthen it. My experience is exactly the reverse of that of Dr. Savage. In the absence of amblyopia, I feel justified in giving a good prognosis, and expect to secure binocular vision. When one eye is amblyopic, I can look only for the cure of the deformity. The tropometer measures the degree of turning of the cornea, and in comparing the records for the different directions we are able to learn some useful facts; but it does not show whether the excess in any one direction is due to increase in strength of the muscles which control that section, or decrease of power of their antagonists, and hence the knowledge gained by its use may be misleading.

TEACHING OF OPHTHALMOSCOPY TO UNDER-GRADUATES AND GRADUATES IN MEDICINE.

W. A. FISHER, M.D.

Professor of Ophthalmology Chicago Eye, Ear, Nose and Throat College; Professor of Clinical Ophthalmology College of Physicians and Surgeons, Medical Department of the University of Illinois.

CHICAGO.

The subject of teaching ophthalmoscopy to under-graduates and graduates in medicine has been selected because the use of such an inexpensive, simple and indispensable instrument as the ophthalmoscope is too much neglected. I am willing to admit that ophthalmoscopy is taught in most medical schools, but from a large experience with post-graduate students I know that practical results are seldom obtained. It is rare to meet a post-graduate student who is able to examine the fundus of the normal eye with even a dilated pupil. If the under-graduate could use the ophthalmoscope in a practical manner the last year of his medical course, his post-graduate work would be simplified and would be more productive of results.

Is ophthalmoscopy too deep a subject for the under-graduate?

I believe ophthalmoscopy is one of the simplest and most interesting subjects for the under-graduate as soon as he can use the ophthalmoscope to see and describe the details of the fundus oculi, and this requires comparatively little practice and technique. The post-graduate student becomes an enthusiast in the revelations of the normal fundus.

What are common diseases of the eye?

From an oculist's standpoint, diseases of the eye revealed in the fundus are not uncommon. If the family physician could use the ophthalmoscope he would not be compelled to call the common diseases only those found anterior to the lens. He would find many interesting cases of disease of the eye that occur in connection with other ailments if he could only see them. Diseases that he could see and diagnose he could treat with satisfaction to himself and patient. Gross pathological lesions of the fundus are not difficult to diagnose if they can be seen; and, if they can be seen text books on ophthalmology are interesting and of great value, otherwise they are nearly useless.

Would ophthalmoscopy be of any value to the senior medical student?

Ophthalmoscopy would be of very great value to the undergraduate, not only to enable him to take advantage of the ophthalmic clinic, but also of many cases in his general medical, obstetrical, neurological or venereal clinics. If he could use the ophthalmoscope in a practical manner in all of these clinics when the opportunity presented itself, ophthalmoscopy would be very interesting.

Doctors as a general rule know nothing of ophthalmology.

It is to be regretted that the general practitioner cannot use the ophthalmoscope and make a creditable examination of the eye. It is hardly fair to the public that he can only see the so-called common or external diseases of the eye, in view of the fact that ophthalmoscopy can be made a simple and easy art.

Methods of teaching ophthalmoscopy.

Instructors in ophthalmology have their special systems of teaching ophthalmoscopy. Some divide the class in small sections and have them practice on clinical patients with dilated pupils or have the students practice on each other. The first method is difficult and unsatisfactory. First, because the class must be very small; second, the patients will not always submit; third, it is not always possible to get the kind of material necessary; fourth, it is difficult with this method to get enough teachers that are capable of imparting the proper knowledge on the subject. From my experience with post-graduates I believe the methods that have been practiced in the past can be improved upon. I am aware that medical schools do not devote enough time to ophthalmology, but the time is being lengthened and we may expect better results.

The method I recommend for teaching this subject is the use of my improved schematic eye, which has two normal and twenty-two pathological pictures, with full instructions for beginners. I would have the student control and master his light by practicing on the schematic eye, in his room, a few minutes each day. The schematic eye is provided with an iris diaphragm, and the student can make at will a pupil as large as thirty or as small as two millimeters. It is surprising how soon the student will master his light and be able to examine the pictures in the schematic eye with a small pupil. His work is made simple and easy by having him begin with a large pupil and gradually reducing its size. After he has sufficient control of the light and can see

and describe the details of the fundus in the schematic eye with a small pupil, he will have little difficulty in seeing and describing the details of the normal eye. When the student can make out the details of the normal fundus, he will be interested in the subject and will wish to know the ocular lesions often found in general medical or surgical cases.

The only thing remaining for the under-graduate after he can recognize the fundus of the eye will be to explain to him the gross pathological lesions that may appear there in cases that occur in general practice. This can best be done with the opaque



projector. The pictures can be carefully selected and we can show any kind and any number of cases. If the diseases can be satisfactorily demonstrated and the student can give a description and draw a picture of the gross pathological lesions at the end of his course, he will certainly recognize such pictures when they present themselves to him later in his general practice.

In a surprisingly short time with this method the under-graduate would be able to take advantage of the dark room cases. The work is simplified and one teacher can teach any number of students until they are ready for the dark room. If he has mastered the schematic eye, little trouble will be experienced with clinical cases in the dark room with small classes. The ophthalmoscope

being the foundation of ophthalmology, it is desirable that the student expecting to accomplish anything practical in ophthalmology should master the instrument early in his course. One should not attempt to make oculists of under-graduates, but it is imperative that the family physician be able to diagnose gross pathological lesions of the interior of the eye as readily as he can detect them in other parts of the body, if he expects to do justice to his calling.

If I may be permitted to diverge from the subject I would suggest teaching the under-graduate retinoscopy. This can be done on the schematic eye with Thorington or any good book on the subject. If he can be taught errors of refraction and prescribe glasses for ordinary cases, no optometry legislation would be necessary. The traveling optician would have no vocation.

DISCUSSION.

DR. BAKER, Cleveland, Ohio:—Owing to the limited time I shall confine my remarks to the teaching of under-graduates. I shall not discuss the necessity of teaching the future physician the use of the ophthalmoscope, and how to correct simple errors of refraction, as Dr. Connor very ably presented this subject at the last meeting of the Academy. I should also like to mention Chairman Hubbell's address on the same subject before the Section of Ophthalmology at Atlantic City last spring and the resolution adopted at that meeting. I was rather surprised that some of the teachers at that meeting were skeptical as to the possibility of teaching this subject to under-graduates. Everyone will grant that it is impossible to teach this subject by didactic lectures or from the text book, but it is comparatively easy if the student is given ophthalmoscope, trial lens, and patients to practice upon, especially if aided by a schematic eye as advised by the essayist.

I think I can best present my thoughts on this subject by detailing briefly the method pursued in our medical school during the past fifteen or twenty years. Junior and Senior students are divided into classes of five or six each. They are required to spend one hour daily for from four to six weeks in the dispensary. One student is required to take a record, make brief notes of the history and record the ophthalmoscopic and refraction findings. In other words, he has charge of the case records, which are kept on card indices. Another student is assigned to make local applications to the lids, syringing the lachrymal sac, instilling mydriatics and making such minor operations as opening chalazia, etc. Two or more are sent into the dark room to make ophthalmoscopic and retinoscopic examinations, and as soon as they have completed these examinations they are required to use the trial case and test lenses for each patient. The students do all the work, the instructor simply directing them, and he can easily take care of five or six or even more at one time, if necessary.

At the end of five or six weeks' daily instruction of this kind, I would rather trust myself, or my patients, to be examined for spectacles by any one of these students than by the best spectacle peddler, optician, or optometrist I ever heard of.

Each student is obliged, as a part of his work, to make a sketch of the fundus of the eye, and I am usually surprised at the facility with

which the medical student of today makes them. In addition to this daily dispensary work, our Senior students are given one hour a week throughout the year, which is about equally divided between clinical and didactic lectures, quizzes and written tests.

They are also assigned to hospitals in small groups of five or six each, for three months each, the same as to the dispensary, for one hour a week, for record cases and witnessing and assisting in operations. Thus it will be seen we give our students about seventy-two hours in the dispensary, about thirty-two hours in didactic and clinical lectures, and twelve hours in hospital service, making one hundred and sixteen hours altogether. The minimum time assigned to eye diseases by the American Medical College Association is ninety-six hours, so that we do not greatly exceed that minimum. I understand the committee of the A. M. A. voted to recommend only sixty-four hours. This amount of time is wholly inadequate, and the committee should hear from us in no uncertain terms.

I do not think any of our graduates in the last fifteen years could fail to meet the requirements of the Michigan State Board, which, as you know, exacts a practical test with the ophthalmoscope and trial lenses. It is quite probable that the Ohio Board will make the same requirement next year. It is quite likely that the other Boards, including Pennsylvania, will soon do so. It seems to me that the time has come when this important part of the practice of medicine should be taken out of the hands of laymen and done by the medical profession. I am sure there is no one present who does not know the examination of the fundus, and the prescribing of glasses is one of the most exacting and difficult parts of the practice of medicine. But why should we give it up because it is difficult, and let the ignorant laymen do it? It has been my observation that wherever there is a field of medicine that is uncultivated by the profession, there quacks abound. I remember a score of years ago that the most blatant advertisements in the Cleveland newspapers, as well as on the fences, were those of pile doctors. About that time our trustees made a professorship of proctology. Since then our graduates have known how to treat an ordinary case of hemorrhoids. I have not seen an advertisement for pile cures in our Cleveland papers for many years. The same thing will happen with regard to the optometrists as soon as the family doctor can practice this part of his profession. Some one remarked facetiously at the Atlantic City meeting that if every doctor fitted glasses, there would be nothing for the specialist to do. This might be a consummation devoutly to be wished for, but practically it does not work out that way. Only a limited number of the profession will care to do refraction work as soon as they have anything else to do. All of them will know something about ophthalmology and errors of refraction, and they will not send their cases to laymen to be fitted with glasses. The men who send me the major part of my consultation work are the ones who know most about eye diseases. I think this is the experience of every one.

In my closing address to our Senior students I have been accustomed to say: "It has been the habit from time immemorial for the recent graduate to take home with him an amputating case, which he probably exhibits with more pride than his diploma; but it is not probable there is one member of this class who will make an amputation during his first year in practice, and more than half of you will never make one. If you do have an opportunity, it is not likely to be an emergency case, and there will be plenty of time to buy, borrow or steal the necessary instruments. If you invest the fifty or one hundred dollars in a case of trial lenses, you will pay for it the first month or two in practice, and it will

be a source of revenue as long as you care to use them. You may not do as good work as the specialist, but you are prepared to do infinitely better work than the laymen who are doing it now, and it is altogether probable that if your patient is suffering from some serious disease you will discover it and if you cannot treat him yourself you will send him where he can get good advice."

DR. L. WEBSTER FOX:—I wish to inform Dr. Fisher that we have been teaching ophthalmoscopy in Philadelphia for ten years. We divide Senior medical students into ward classes. This year we have 130 men. It is difficult to make ophthalmoscopists out of all, but we can train many of them to use the ophthalmoscope and to test for presbyopia, etc. Five men are assigned to external diseases of the eye, five to the refraction and five to the ophthalmoscopic room. In this way we try to make fairly practical ophthalmologists of many of them.

With regard to teaching with schematic eye, we do not find it of much value. I brought the first one from Europe and tried to make use of it for demonstrating purposes, but did not find it as useful as its inventor claimed. Students want to see the human eye and thus be able to discriminate between the normal and the diseased eye.

In regard to the State Board examinations, our students are being prepared for them. We had one student from Michigan last year, and as its State Board requires a knowledge of ophthalmology we placed him in the out-patient department of the hospital, thus enabling him to obtain a practical knowledge of refraction. When he came up before the State Board he was qualified and successfully passed the Board.

I would like to speak in reference to the teaching of ophthalmoscopy in post-graduate work. The mechanical part of ophthalmoscopy, that is, the proper method of holding the ophthalmoscope, the position of the light with reference to the mirror, the art of quickly and accurately reflecting the light into the patient's eyes, and also the ability to relax the accommodation, is not so easily acquired as one would think. It seems to me this little instrument of Dr. Fisher's is admirably suited to these purposes. With it one can teach the students to relax the accommodation and to reflect the light into the eyes quickly and accurately. The schematic eye seems also to have some special features; as the iris condenser, and the backgrounds supplied with the eye which more accurately represent the actual conditions of the human eye when diseased; for example, there is an actual depression at the site of the optic nerve in the chart, representing that which we have in glaucoma, and there is also an actual elevation of the background in the detachment of the retina, as we have in that affection. In other words, the pupil is taught to accurately measure the depth of the eye as well as the pathologic condition present in it. The only criticism I have for the schematic eye is that there is no normal point marked on it from which other graduations could be made for hypermetropia and myopia. This defect, however, could be easily remedied on this schematic eye as it now exists.

As to the actual clinical teaching of ophthalmoscopy, it is a hard matter to take four men in a special class, even in post-graduate work, and hold the patients. You may have a beautiful fundus case, and after four men take their turn to look into the eye, especially if they have had no training with the ophthalmoscope, or with the schematic eye, half an hour, or an hour, perhaps, is consumed before each one has had an opportunity to see it, and after two or three seances of this kind the patient usually disappears. Hence the value of a schematic eye to prepare all students for the actual mechanical part of ophthalmoscopy, and it seems to me that Dr. Fisher's model fulfills this requirement in a most excellent way.

DR. CONNORS, Detroit:—I was greatly interested in the presentation of the papers. It tells of an additional help for under-graduates and others to see what is inside the eye. I recall an experience of thirty years ago when I first attempted to teach a student what was inside an eye and saw his great delight, and feel that a doctor who has not experienced the same pleasure has missed much. But a larger problem has been introduced that appeals to us just now, and it is of that I have a word to say. During my life it has been generally taught that only a specialist could learn how to do simple refraction. The profession and students have been and are still afraid to learn to do it. Last year at Cleveland I read a paper before this body on Ophthalmology for General Practitioners. I was told that family physicians could not learn to do simple refraction. I knew perfectly well then, as I know today, that unless educated physicians know how to do simple refraction, laymen will do it, because we ophthalmologists cannot do it; there are not enough of us. But I talked before one of the county societies and interested the members, and as a result six of the doctors in that society are doing simple refraction. During eight months they have done from eight to twenty-five cases each with more or less satisfaction to their patients. So interested were all the doctors in that society that one lately read a paper on "Refraction" at a meeting, and all discussed it. It is said that traveling opticians have left that part of Michigan. I brought it up to the Michigan State Board of Registration, and believing it wise for profession and people, they notified all medical colleges February 12 that all persons who wanted a license to practice in Michigan thereafter must take a trial case with a patient and show that they could do simple refraction. Then some colleges began to teach a working knowledge of simple refraction. The tide is on, and the profession is going to learn to do the things that optometrists do. I want to encourage the doubtful and say it has been done in our State, and when it is done everywhere, optometry will be dead.

DR. REEVE, Toronto:—Our professor of physiology considers it quite legitimate to introduce what he calls applied or practical physiology. He makes the students study the normal sounds of the heart on the living subject. So he makes them endeavor to examine the normal eye with the ophthalmoscope. In this way they learn to handle the ophthalmoscope. When they come to the year before graduation, they will be required in classes to use the ophthalmoscope on the schematic and human eye and go into the subject of refraction. Then in the last year all the members of the graduating class are divided into groups of about twelve or fourteen each, and each group is required to spend certain hours with some demonstrator or professor or lecturer on ophthalmology in the out-patient service. So they have some familiarity with the ophthalmoscope, and that is a great point. We must recognize a certain evolution in educational work, and the great difficulty now is that we have to crowd too much work into too short a time. Our first degree (M. B.) will be given at the end of five years—[when two more classes of the former four years' course have graduated.]. So far we have not secured time enough to teach the ophthalmoscope as we would wish.

DR. JACKSON, Denver:—We should not lose sight of the fact that this schematic eye has an iris diaphragm that can be changed so it gives a pupil from 30 mm. down to 2 mm. The importance of this is enormous in an instrument that is to be used in teaching students. It allows the student at the start to do what any body can do without practice, see the image through the large pupil. He can then gradually increase the difficulty as rapidly as he can teach himself to overcome it, until

he can see into an ordinary pupil. There is a great difference between this and being defeated in the earlier efforts to do too difficult a feat.

Dr. Reeve referred to a matter that is of practical importance to all of us in teaching ophthalmology in the schools. That is that ophthalmoscopy can be taught in the class in practical physiology, or as a part of the work in anatomy. It is a kind of microscopy and bridges the gap between classical observation and the use of the microscope. If the student should learn how to use the ophthalmoscope early in his course it would be of the greatest value to him, not only in his subsequent work in ophthalmology, but in general medicine and in pathology. It would give him exact ideas of some pathologic conditions that he would not get in any other way. The time is ripe for the demand that students should come from the classes on physiology and anatomy trained in the use of the ophthalmoscope.

DR. FISHER (closing) :—I have found the greatest difficulty in teaching ophthalmoscopy to be in getting the student to see the fundus. After he can recognize the fundus he will take an interest in not only pathological lesions, but the normal fundus will be interesting.

If the schematic eye will be of an assistance in manipulating the light, and I know it will, I feel that much time is gained. A large class can be taught in this manner until they are ready for the dark room. The student will master the light in a very short time by having a model in his room. The iris diaphragm Dr. Jackson speaks of is of great importance. The student can start with a large and gradually reduce the size of the pupil, making the work easy and interesting from the start.

Regarding the marking Dr. Davis speaks about, will say I have left off the marking because a great many think one must relax his accommodation before he can make a diagnosis. I do not think it absolutely necessary for one to relax his accommodation to be able to make diagnosis of gross pathological lesions in the fundus. If the student thinks he must measure the refraction of any eye accurately before he can make a diagnosis, he will get discouraged. I have not had this instrument marked in diopters for this reason.

MASSAGE AS AN OCCUPATION FOR THE BLIND.

L. WEBSTER FOX, M.D., LL.D.

Professor of Ophthalmology in the Medico-Chirurgical College and Hospital.
PHILADELPHIA.

No longer do we hear the cry of "Pity the Poor Blind." In these days the blind ask aid to work in order that they may assume their proper position in society. Those who are trained ask us to test their abilities and render them our sympathetic and efficacious assistance, but not our alms.

The erroneous idea that physical darkness implied intellectual darkness has long since been disproved and dispelled, for a long list could be given of blind persons who have become famous as travelers, statesmen, authors, poets, mathematicians, musicians and workers in handicrafts of various kinds.

Many are the occupations for which the blind are now being trained, some being of a manual, some of a professional, and some of a literary character. Not a few are in some way engaged in journalism. For instance, at the office of the "Petit Meridional" of Montpelier a blind person has charge of the telephone, receiving the news from Paris which he immediately speaks into a phonograph. He makes the phonograph repeat the record which has been made; he then writes it off with a Remington typewriter and in that way produces copy for the press. There are at the present time several blind persons in large hotels and factories of London and New York, who are operating telephone switchboards, and others are reproducing with accuracy on the typewriter material which has been spoken into the phonograph.

Massage, however, seems to be an ideal occupation for the blind, one which is not greatly influenced by the economic changes of the world. It is far from being a *new* occupation for the blind, as for more than one thousand years it has been practiced by them in Japan.

Professor Yoshimoto of Japan, who has been appointed the principal of the Model College for the Blind in Tokio, has recently paid a visit to the United States, and incidentally visited the Medico-Chirurgical Hospital in Philadelphia. He is very enthusiastic as to the employment of the blind as masseurs and urges their being trained for that profession. He reports that in Japan the blind masseur has proved very satisfactory and is highly appreciated by doctors and patients. In Japan the major-

ity of the masseurs are blind and almost all the blind are masseurs, and until recently they possessed special privileges in that country. The students spend from three to five years at the schools for the blind. First they obtain a general knowledge of anatomy, physiology and pathology. Then they study minutely massage and the ailments which it cures. In practicing massage they use only the hand, so that great attention is paid to improving the sense of touch and the training of the fingers to rapid and skilful movements.

Blind masseurs are used to teach the blind the art of massage. Professor Yoshimoto tells us that the blind masseurs know many ingenious methods by which they can well make up for the deficiency of sight. For example, though the blind cannot see the expression of their patients' faces, they can observe them just as well by lightly feeling certain muscles in the face, and see if their treatment is strong or weak. Indeed practicing massage would not be an easy matter at all for the blind in Japan if they did not learn many ingenious methods which have been invented through the joint experiences of many clever blind masseurs.

In Yokohama, with a population of 500,000 souls, there are about 1,000 masseurs and masseuses, of whom 400 belong to a corporation, 500 work upon their own account and 100 are sighted persons. In 1906 the Japanese Parliament contemplated making a law which would assure to the blind the monopoly of massage.

The National Institution for Massage for the Blind, which has its headquarters in London, has been rapidly gaining the cordial recognition of the profession and the confidence of the public. There are now more than sixty trained blind operators who are graduates of this institution. Several during the first year, after completing their training, have earned on an average \$400 to \$500 a year. Many have found employment in hydrotherapeutic establishments, whilst others have successfully practiced massage on their own account.

The work in London is under the presidency of Dr. Malcolm McHardy, and such prominent members of the medical profession as Sir Anderson Critchett, Drs. R. Marcus Gunn, Arnold Lawson, William Lang, J. Fletcher Little, etc., are active members of its board of managers. These names afford a guarantee of the efficiency of the training which the blind receive in the London institution. There exists in this institution an inviolable rule that the masseuses shall only treat women and children, and that the masseurs shall only treat men. In other parts of Great Britain, especially in Edinburgh and Manchester, the blind are edu-

cated in the art of massage. Similar efforts to train the blind for this occupation have, in recent years, been made with much success on the continent of Europe in Stockholm, Copenhagen, St. Petersburg, Koenigsberg, Brunswick, Frankfort, Berlin, Leipzig, Kiel, Nuremberg, Brussels, Paris, Lyons and Lille, and in this country in New York, Boston and Philadelphia. At the Orthopædic Hospital in Philadelphia, systematic instruction in massage has been given to several blind persons. Fourteen of both sexes have been already graduated from this hospital, and they have been more or less successful in practicing the art.

In a previous paper on "Massage as an Occupation for the Blind," I have emphasized the importance of the most thorough training of the blind for practicing massage. They should be healthy, well informed individuals. They should possess refinement of manner, should have good moral habits; the breath should be irreproachable, and the hands should be well formed and smooth, being neither too fat nor too thin, and above all things, not moist.

Where the blind graduates in massage have been given an opportunity to show their ability, the results have proved very satisfactory, and it has been found that the blind can perform as good work as their sighted colleagues, and in some cases their blindness makes them even more acceptable.

As yet the number of the blind prepared to practice the art in this country is comparatively small, and the members of the medical profession have not realized what a blessing they would confer upon their sightless friends if they encouraged their patients to employ blind operators.

For the blind to succeed in this occupation they must have the support of the medical profession, and then their patients will receive the blind masseur with pleasure. It is to be hoped that all those who are interested in helping the blind to help themselves will do their utmost to recommend the employment of the blind as masseurs and masseuses, and give the operators an opportunity to demonstrate their ability to perform the manipulations with the same skill as their sighted competitors.

Massage, whilst being a new field of labor open to the blind in this country, ought to be an ever widening one as surgeons and physicians come to appreciate its value and application as a therapeutic measure.

The New York Association for the Blind, which is carrying on a most admirable work at 118 East Fifty-ninth Street, at one time set apart an office for the treatment of massage by a skilled

blind masseur, who was graduated from the Institution for the Blind at Overbrook, and was afterward trained for massage at the Orthopædic Hospital in Philadelphia, Pa. The office was not much patronized and the room has recently been used for other purposes. I learn through Miss Winifred Holt, the gifted and indefatigable Secretary of the New York Association for the Blind, that it has been a disappointment that so little progress has been made with the public in inducing it to employ blind masseurs. However, it is gratifying to learn that a young masseuse, in whom the officials of the New York Association are interested, is meeting with considerable success in that city. She lost her sight five years ago and took up massage as an employment. The doctors for whom she works, among them two at Luge's Hospital in New York, speak of her ability in the highest terms. One of the smaller hospitals in the city being desirous of giving lectures on massage to the nurses in the institution, has engaged this young woman to give this course.

In a previous paper I referred to Mr. William J. Nealon of Philadelphia, who lost his eyesight on the eve of his being graduated as a doctor of medicine. He studied massage, for which his anatomical and medical knowledge particularly fitted him, and he is still successfully and acceptably practicing his art in Philadelphia, and is officially attached as Masseur in Chief to the Howard Hospital. He also practices massage in St. Agnes' Hospital.

These two instances illustrate the ability of the blind to administer this valuable adjunct to medical and surgical treatment, but it is as yet a novelty to the profession and to the public in this country. The time is, however, at hand, we believe, when the superintendents of hospitals and sanatoria, as well as the members of the profession generally, will realize that the blind can be as thoroughly trained and can as efficiently administer massage as any sighted person.

It seems to me that if this work is to prosper in this country, it must be carried on as in London, directly under the auspices and fostering care of members of our profession. In England several physicians have announced that they will employ no other than blind masseurs for their patients, as their delicacy of touch enables them oftentimes to detect structural changes which are not appreciated by the sighted.

DEMONSTRATION OF THE SIZE AND POSITION OF
THE ANGLE ALPHA BY A SIMPLE MODIFICA-
TION OF THE JAVAL-SCHIOTZ OPHTHALMOMETER.

DR. LUCIEN HOWE.
BUFFALO, N. Y.

If a line is drawn through the center of the refracting media, with the center of the cornea as one point and the center of the lens as the other point, we have agreed to call this the *optic axis*.

Again, if a line is drawn from the macula lutea to the object at which the eye looks, this line we have also agreed to call the *visual axis*. In the normal eye the visual axis passes somewhat to the inner side of the lens and the center of the cornea.

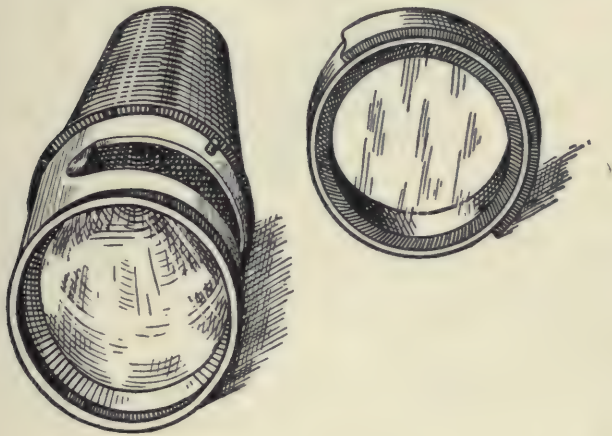


Fig. 1.—Arrangement by which the prisms can be removed from the Javal ophthalmometer, thus converting the instrument into a telescope for determining the position of the lens.

The angle enclosed between these two lines was called at first by all writers the angle alpha.

From the earliest time students of physiological optics have been unanimous as to the names and positions of these two lines. We all agreed upon these statements just as much as we have agreed that the earth is a sphere. But if some one should insist that the earth is not a sphere, but is flat, naturally we ask ourselves what are the different well known proofs of our ordinary views on this subject.

In a similar way if anyone should say to us that the visual axis and the optic axis coincide in emmetropia and in ametropia, naturally we ask ourselves what are the proofs of the usual conception of students of physiological optics concerning this point. My object is to present simply one set of these proofs of a very common form. These relate to the entoptic images.

For our present purpose it is sufficient to deal with the reflection from the anterior surface of the cornea, and the one from the posterior surface of the lens. In order to see these, attention is called to a modification of the Javal-Schiotz ophthalmometer, which was described in my first volume on the Muscles of the Eye, but has not before been thus far demonstrated. It consists:

First. In simply removing the double refracting prisms from the tube of the instrument, thus converting it into a simple telescope.

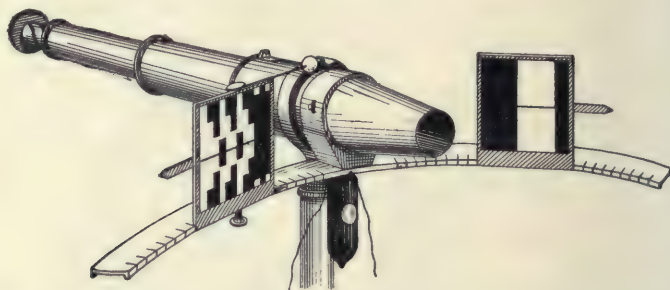


Fig. 2.—Arrangement of the Javal ophthalmometer when converted into a telescope with a light below and a movable point of fixation (a glass ball) above, for determining the position of the lens.

Second. In placing a candle or small electric light directly above or below the tube.

Third. In attaching to one of the mires a glass ball at such a point that the ball is over the center of the tube when the index of the mires marks a certain point on the arc; for example, five degrees.

It is a very simple matter to measure this angle in any individual, especially if the pupil is dilated with cocain or homatropin. Let us suppose, for example, that we wish to measure the angle α in the right eye of a patient. The most convenient method is to run a couple of turns of roller bandage over the left eye. The person then sits before the table with his chin resting on his hands, or, still better, with his teeth resting on the "Helmholtz pit" of an ophthalmologic head rest. The room is somewhat darkened, and the candle or electric light, which is in the same vertical plane as the axis of the telescope, is lighted.

As the observer looks through the telescope he sees the two reflections. The brighter and larger of these is, of course, from the anterior surface of the cornea, and that being a convex mirror, shows the flame of the candle or the electric light bright and distinct. The second reflection is from the posterior surface of the lens. This is only a small point. The reflection from the anterior surface is seen with some difficulty and only with a telescope which has a focal distance with which it is inconvenient to work. Therefore for our present purpose that reflection is ignored.

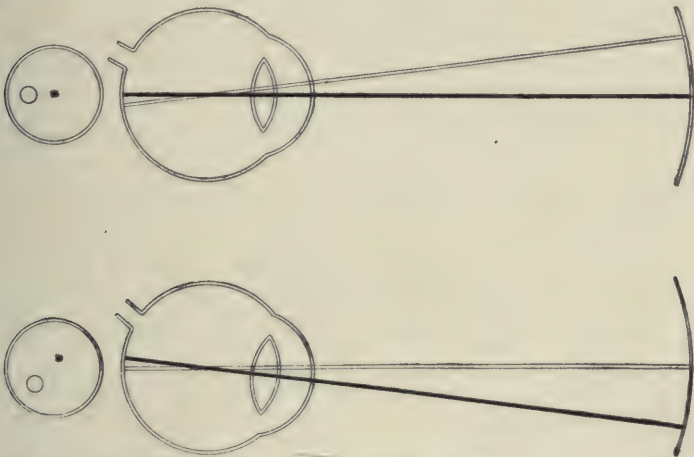


Fig. 3.—Relative position of the entoptic images. When the observer sights along the lighter line into the right eye, for example, of the patient, he finds the entoptic images are usually not in the same line. When, however, the patient has turned through a sufficient arc to the left so that the observer looks from the same point along the heavy line, then those images are in a vertical line, if the lens is not otherwise displaced.

When we ask the person under examination to look into the tube of the telescope, we see these two reflections as described. The large bright one from the cornea being above and to the right, the small one from the posterior surface of the lens being below and to the left. In other words they are not in the same vertical line, and their position shows of course that the lens of the right eye is then facing toward the right side of the person under examination. That is to say, *the optic axis of the eye does not correspond with the visual axis*. Next let us see at what point the reflection from the cornea is in the same line with the reflection from the posterior surface of the lens. In order to do that we ask the person to turn his right eye slowly toward the left, and in order to ascertain just what degree he does this, he is directed to look at the glass ball which is arranged to slide

above the brass arc, attached to the telescope, the curvature of this arc being such, of course, that the center of the arc corresponds to the center of the eye. If we move the glass ball or whatever is chosen as the fixation point, over this arc, gradually from the vertical plane of the center of the telescope toward the left of the person under examination, then as the patient continues to look at the glass ball, the observer notices that the small reflection from the posterior surface of the lens gradually comes nearer to the same vertical line as the reflection from the cornea. If the person under examination is an emmetrope, we can usually pass the ball over three, four, five or more degrees to the left. When the observer finds that the reflection from the posterior surface of the lens *is* in the same vertical line with the reflection from the anterior surface of the cornea, *then* the axis of the telescope corresponds with the optic axis of the eye under examination. A line drawn from the glass ball to the macula lutea represents, of course, the visual axis. The angle between the optic axis and the visual axis is, according to our definition, the angle alpha. In this case, therefore, we read off on the arc the size of the angle and we know positively that the anterior pole of the eye lies say five degrees to the temporal side of the visual axis.

This is not a question of theory, but merely a well known fact. My excuses for presenting this subject is that the existence of the angle alpha has been denied, and also that it can be made so easily shown by means of this modification of Javal-Schiotz ophthalmometer.

DISCUSSION.

DR. SAVAGE:—The angle Alpha, as is well known, is formed by drawing the line of regard from the primary point of view to the center of rotation, at which point it joins Helmholtz's so-called optic axis, but does not cross it, whereas the angle Gamma is formed by the intersection of the visual and the optic axes at the nodal point. I have just been able to show, in my paper, that these two axes do not intersect at the nodal point, but their point of intersection is the center of rotation. The angle Gamma, therefore, has no existence. The angle Alpha is formed at the center of rotation by the intersection of the real visual axis and a line corresponding to Helmholtz's optic axis, unless the two happen to coincide, as they do in the ideal eye. When they do not coincide, the angle exists, and can be measured. The practical value of this knowledge is this: The best retinal image is at that point of the retina which lies in a straight line, passing from the center of the corneal curve through the center of rotation, back to the retina. If that point is the center of the macula, the best image is on the macula; but if they are separated by an arc of five degrees, the macular image is not as sharp as it otherwise would be, and the vision of such an eye cannot be

made equal to 20/15, often not even to 20/20. The size of this angle can be easily determined by the old Javal ophthalmometer. The reflected image of the outer circle, in ideal eyes, has for its center the center of the corneal curve. In non-ideal eyes the center of the reflected image is nasalward from one to several degrees.

REPORT OF A CASE OF NODULAR OPACITY OF THE CORNEA CURED BY EXCISION.

G. B. JOBSON.

FRANKLIN, PA.

This case is presented to this session in view of the extreme rarity of the affection (twenty-six authentic cases being reported to date, and of this number only four were seen in this country), and for the purpose of giving to the profession a method of treatment which effected a cure in a disease which, as far as I can learn, is thought to be incurable.

Dr. Green, Jr., reported a case with slight visual improvement by tuberculin injections. While Dr. Zentmayer's case was not benefitted by the tuberculin treatment, iridectomy, in selected cases, has been beneficial. Local medication is of no avail.

I am indebted to Dr. H. P. Hammond for the general physical examination of Mrs. P., a widow, aged sixty-two. Her father died at sixty-four from diabetes. Her mother, who was always well, died in childbirth and had one miscarriage. Patient has a brother and two sisters, all well. She has several half brothers and sisters, one of whom died of pulmonary tuberculosis.

When she was one an done-half years old she had "scrofula," which began with a photophobia for which she had to be kept in a darkened room. At about two years old the glands back of the neck enlarged, suppurated and discharged for over a year, then cleared up and she became a very robust child and never has had any similar symptoms since. She had typhoid for eight weeks at age of fifteen and since then had two "pneumonia" (?) attacks, the worst of which she was up and about from in two weeks.

She was married at twenty-three, had two children and one miscarriage. One child died of valvular heart trouble. The other is well.

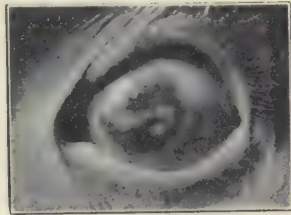
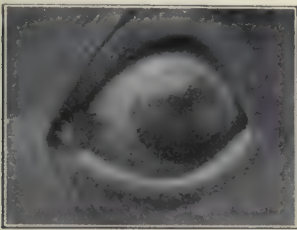
Patient is well nourished and usually strong. She is full chested and upon careful examination we can find no evidence of lung or heart lesions, either active or healed. A urinalysis was negative.

OCULAR HISTORY, OCTOBER 20, 1908.

About twenty-five years ago the patient's attention was first called to a small hazy spot on the left cornea, toward the outer canthus. Two other spots developed within three years after-

ward, and these, with the first, gradually grew and protruded from the surface. Their growth was accompanied by slight epiphora, photophobia and a gritty sensation at times. A physician was consulted, who prescribed eye drops, which improved the eye slightly. Later three more spots appeared toward the inner side of the corneal surface. About five years ago two spots appeared on the right cornea a little above the center. These are separated by a small portion of comparatively clear cornea, just in front of the pupil.

Ocular examination of the left eye showed six irregular grayish opaque nodules elevated above the surface and arranged in a roughly concentric manner, in the pupillary area of the cornea. Their bases tended to coalesce. The intervening and surrounding corneal tissue was nebulous. Under high magnification this haziness was apparently due to very small punctations.



The right eye presented two masses similar to those in the left eye, situated on each side of the pupillary area of the cornea a little above the center. The upper half of the cornea was slightly hazy. The lower half was comparatively clear and sharply defined from the upper. R. V. 20/40. L. V. counting fingers.

There was never any inflammatory manifestations in either eye.

PATHOLOGICAL REPORT BY DR. LEO LOEB, M'MANES LABORATORY OF PATHOLOGY, UNIVERSITY OF PENNSYLVANIA.

"I had sections made of your specimen and on examination found the following:

The piece consisted of an entirely necrotic part of the cornea, devoid of nuclei. There was some incrustation with lime salts in the necrotic piece. No tubercle bacilli, no leucocytes or infiltrating connective tissue present. The necrotic area of the cornea proper was covered by epithelium, which was thickened at the margin, and showed some degenerating hyaline cells."

Treatment—After using dionin and ung. hydrag. oxidi flav.

for about six months without improvement, the patient submitted to excision of the affected corneal tissue of the left eye.

This was decided upon from the fact that it was noticed that clear corneal tissue appeared beneath a nodule when it was removed for histological examination.

After cocainization the masses were first cut off with a very small scalpel, and following this procedure the remaining hazy corneal tissue was carefully shaved off until transparent tissue was encountered. Gentle use of a sharp chalazion curette completed the operation.

The right eye was not operated on as vision in it was not so seriously impaired at this time. However, it has grown somewhat worse since.

The after treatment consisted in the use of ice compresses for relief of pain, and irrigation with an alkaline and antiseptic solution (Seiler's formula) two or three times a day. Slight inflammatory reaction followed for three days, when it gradually subsided, and in about ten days afterward regeneration of clear corneal tissue commenced to show at the border of the denuded surface.

Regeneration continued slowly until the entire exposed area was covered by clear and smooth tissue in about six weeks after operation.

On September 15 the vision of the left eye had improved to 20/70, while that of the right eye decreased to 20/50. If the sight in the right eye continues to fail it will be operated on at some future time.

Unfortunately I did not refract the patient, as I had intended doing just before leaving for this meeting, as she was out of town, and would not return in time for the examination.

The photographs show the condition before the operation and after recovery.

DISCUSSION.

DR. DUNBAR ROY, Atlanta, Ga.:—I was much interested in the case, first, as to the success with reference to treatment. For three years I have had four cases which I consider to be the condition as described by Fleitzig, Fuchs and Grünwald. There is a diversity of opinion as to these various chronic conditions. They are called under different names, and I think many cases are reported which are not identical to each other. They are called "lattice shaped, grill," etc. I do not think there is any doubt that there is a difference in the character of these cases. In the real grill like keratitis, we sometimes find there is no reactive condition. It is chronic and never produces any symptoms except the dimness of vision. There is no photophobia, no pain. This case of the doctor's seemed to have been an inflammatory condition with an exudation, entirely different from those I have seen in one family.

Fleitzig reported two years ago forty-two cases from his clinic, and brings his article up to date. In the cases that I have, the first symptom, a lady about forty-eight years old came to me complaining only of dimness of vision and wanting glasses. I undertook to refract and found I could not do anything with her. Then with oblique illumination I found scattered over and jutting out of the cornea little opaque particles like bran. It was most intense over the pupil and gradually shading towards the periphery. She had never had any pain and did not know that there was anything the matter with the eyes. I found on inquiry that this condition had started when about fifteen years old and her vision had gradually diminished. After thorough examination I began to read up and my conclusion was that it was the case described by Fuchs and Grünwald. I asked her if there were others in the family and she said her children had weak eyes. I asked to examine them, and found a son twenty-eight years old, a daughter twenty-five, a son twenty-two and a daughter seventeen. In every one of these children there is identically the same condition as found in the mother. The condition is not so severe in the oldest child as in the mother and the gradations gradually go down, so in the youngest child there is only one bran-like spot in the cornea in one eye. As she grows older this will increase, no doubt. My idea is that it is a hereditary condition and a degenerative change in the corneal tissue. In my own case I have been unable to do anything with them. I have excised a number of spots, curetted them and done everything possible without benefit. Every one has hypermetropia. All wear glasses of one to three diopters. The doctor's case is different from the ones I have, but they are those reported by Fuchs and Grünwald.

DR. REBER:—I do not think these cases are so rare as the literature would indicate. It is likely that there are a number that do not come to a proper diagnosis. I am pretty sure that I have had one at least, and probably more. This case occurred in a woman about fifty-five years old, in whom the process, according to her statement, had been going on for three and a half or four years. The condition presented in her case corresponded exactly to Grünwald's description. I have the same views as to treatment as Dr. Jobson, but the lady referred to absolutely declined any operative measures whatever. I fell back on our good old friend, the yellow oxide of mercury ointment, beginning with ten grains to the ounce for two weeks, fifteen grains to the ounce and then twenty grains, and so on, until she was using 100 grains to the ounce. This was necessary because the ocular tissues had acquired toleration. The vision rose from 2/60 to 5/20, making it really a serviceable eye. The results were far beyond my expectation. I told her I did not expect anything much from local medication.

QUESTION:—What did you use for a menstrum?

DR. REBER:—Lanolin. I am fond of increasing the oxide of mercury in that way in the various non-suppurative corneal diseases.

DR. JOBSON (closing):—I do not believe, as many do, that nodular opacity of the cornea is one of tuberculosis per se, but that the nodules consist of an accumulation of degenerated corneal cells, caused by interference with their metabolism by certain toxins circulating in the system.

Ophthalmologists and physiologists have for years noticed regeneration of corneal tissue clinically and experimentally. And I think we might take advantage of this fact more often than we do in corneal operations.

Since operating on this case I have had two pterygia cases in which I have gone deeper than usual, with the result that the cornea in both cleared up better than by removing the growth only.

THE POLES OF THE EYE AND THE SIGNIFICANCE
OF THEIR TRUE LOCATION; AND THE BINOCU-
LAR SPACIAL POLE WITH ITS FULLNESS
OF MEANING.

BY G. C. SAVAGE, M.D.

NASHVILLE, TENN.

I venture to speak once more on the general subject of binocular rest and motion, and for the reason that I am anxious for you to see the truth, if I have it; but, if I have not the truth, that you may show me my errors. I must be pardoned for using just here a very strong expression, my purpose being to more certainly command your closest attention: If the fundamental principles of binocular rest and motion, which I have advocated for many years, are correct, then all authors writing upon the same subject, from Helmholtz to Howe, are in error. Not a chapter on this subject in any book except my own has been based on the fundamental principles which I have enunciated. In stating this I am simply acknowledging that the book writers were not yet my disciples when their latest editions appeared. Nor would I have them follow me only as I myself walk in the light of truth.

In my paper read before this Academy two years ago I pointed out that Helmholtz's teachings on ocular motion had been founded on three fundamental errors. These were: (1) In locating the poles of the eye he began the optic axis at the center of the corneal curve, making this point the anterior pole, and carried this line back through the center of rotation to a point on the retina usually between the macula and disc, naming this point the posterior pole. (2) He made the visual axis intersect the so-called optic axis at the nodal point and this caused it to cut the cornea a few degrees to the nasal side of the corneal center—his anterior pole. (3) He concluded that the lines connecting objects and their images are axial rays of light, each crossing all the others at the nodal point. To these fundamental errors is chargeable the fact that no man, not even his brightest pupils, has been able to understand Helmholtz's chapter on "Rotations of the Eyes." Even he himself must have recognized the murkiness of this chapter, for, when one of his brightest pupils said to him while on a pleasure walk, "Professor, I have no trouble with any part of your 'Physiologic Optics' except the chapter on rotations of the eyes," he said: "I am not astonished to hear you speak so. Leave that

chapter alone, for, though it cost me more time and thought than any other part, I must rewrite it; then I hope to make it clear." He lived many years after this conversation, but he never rewrote that chapter. If he had been fortunate enough to have discovered his three fundamental errors, he would have rewritten that chapter in such a clear, strong and masterful manner as to leave nothing for subsequent writers to do except to endorse and to quote.

Against these fundamental errors of Helmholtz I want to place three facts, or truths, which I discovered many years ago, which facts have been the foundation of all that I have taught in my two books, *Ophthalmic Myology* and *Ophthalmic Neuro-Myology*, and in other writings. They are these: (1) The central point of the macula is always, in all eyes, the posterior pole; (2) the visual axis, passing from the macula through the center of rotation, is the true and only optic axis, and the point of the cornea cut by this line, as it goes out into space, is the anterior pole, whether this point be the center of the corneal curve or not; (3) lines of direction, that is, lines that connect retinal images with their respective special objects, are radii of retinal curvature prolonged, hence, each must cross all the others at the center of the retinal curve, which is the center of rotation. Incontrovertible proof—proof that has not been controverted—of the correctness of these three propositions, was presented in my paper, "A Further Study of the So-called Horopter, Making Ocular Rotation Easy of Understanding," already referred to. I thought then that no further argument would ever be necessary, nor did I think that any additional proof, both stronger and clearer, would ever be forthcoming. I am now ready, however, to cap the climax of proof with evidence which is not only incontrovertible but wholly convincing.

I will ask you to study, first of all, Fig. 1. This represents the non-ideal eye of Helmholtz, in which o , the center of the cornea, is the anterior pole, and a , between the macula and disc, is the posterior pole, and $o-c-a$ is the optic axis. $P.P.$ is the primary point of view, whose retinal image is at m . The so-called visual axis of Helmholtz, connecting object and image, crosses the optic axis at the nodal point N . $S.P.$ is the secondary point of view, whose retinal image, according to Helmholtz, is at x . The indirect visual line, $S.P.-x$, connecting this secondary point of view and its image, crosses the visual axis at the nodal point N . Motionless objects in space and their retinal images bear an unalterable relationship to each other. For this relationship to be maintained,

when the point of view is changed, the visual axis must assume the position of the indirect visual line that connected the secondary point of view with its image, before the rotation began. Since in Fig. 1 the visual axis $P.P.-m$ lies to the outer side of the center of rotation, c , while the indirect visual line $S.P.-x$ lies to the inner side of the center of rotation— c —the former can never be made to assume the position of the latter. To show the confusion that would occur when such an eye is rotated, the figure must be com-

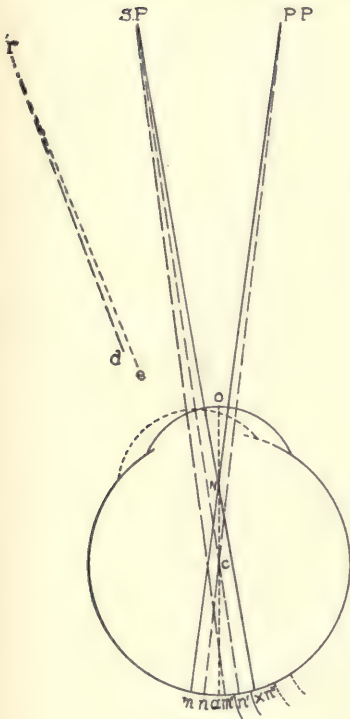


Fig. 1

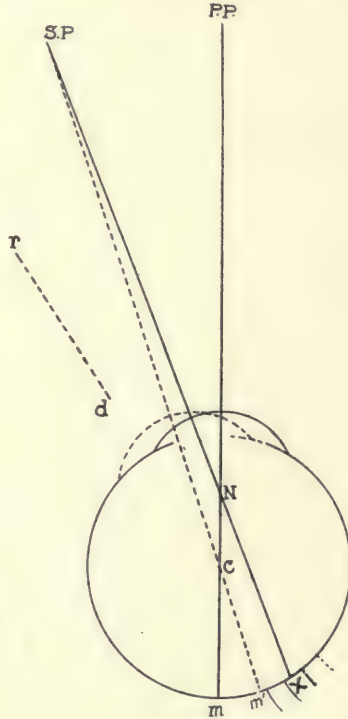


Fig. 2

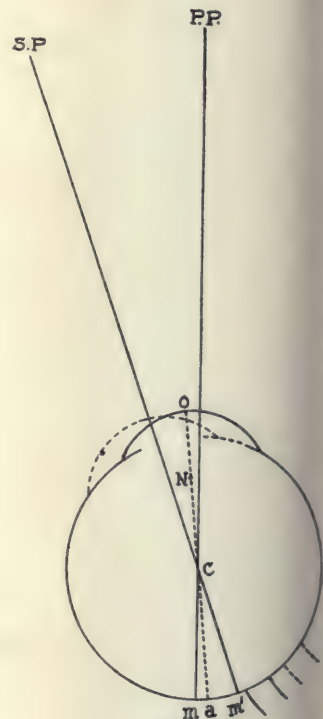


Fig. 3

plicated by drawing a line from $P.P.$ through c to n . This line $P.P.-c-n$, a radius of retinal curvature prolonged, will have its relationship with $P.P.-m$ unaltered in any rotation of the eye. When the eye rotates from $P.P.$ to the point $S.P.$, the position of the prolonged radius is $S.P.-n'$ and that of the visual axis $S.P.-m'$. The visual axis in space has reached the secondary point $S.P.$, but has not reached the retinal image at x , for even $S.P.-n'$ has stopped short of x , and m' is just as far behind n' as m , in the primary position, was distant from n . The macula m may be rotated under

the secondary image at x , but when this is done the prolonged radius $P.P.-n$ will assume the position $n''-c-e-r$, and the visual axis will take the direction $x-d-r$. Since, in monocular vision, any point whose image is on the macula appears to lie on the visual axis, the secondary point of view would appear to be at r in space, removed nearly twice as far from the primary point as it was before the rotation began. The images have remained the same distance apart, but the motionless objects in space have apparently become more widely separated. This is out of harmony with human experience.

In the next place I will ask you to study the ideal eye of Helmholtz, as shown in Fig. 2. In this figure the visual axis $P.P.-m$ cuts the center of the corneal curve, Helmholtz's anterior pole, and therefore coincides with his optic axis, the macula becoming the posterior pole. The secondary point of view is $S.P.$ and its image is supposed to be at x , the two being connected by the indirect visual line $S.P.-N-x$. As in Fig. 1, $P.P.$ and $S.P.$ are motionless points in space; therefore they and their images must bear a fixed relationship the one to the others, hence, when the eye rotates from the one point of view to the other, the visual axis $P.P.-m$ should assume the position of $S.P.-x$, but since the one passes through the center of rotation and the other does not, the former can never become the latter. To show what would take place we must extend a line from $S.P.$ through the center of rotation c to the retina at m' . When the eye is rotated from $P.P.$ to $S.P.$ the visual axis $P.P.-m$ assumes the position $S.P.-m'$. The spacial end of the visual axis has reached the secondary point, but the retinal end has fallen short of its image. The macula m can be rotated under the image at x , but when this has been done the motionless point $S.P.$ will appear in the direction of $x-c-d-r$. This, too, is contrary to all experience.

Many years ago I announced as a fact that the central point of the macula is the posterior pole, and that the anterior pole may or may not be the center of the cornea. I also announced at the same time that all lines of direction are radii of retinal curvature prolonged, and not axial rays of light. Fig. 3, representing a non-ideal eye, that is, an eye whose true anterior pole is to the nasal side of the center of the corneal curve, proves conclusively that I discovered the truth. In this figure $P.P.$ is the primary point of view and $S.P.$ is the secondary point of view. The image of the former is on the macula at m , while the image of the latter is on the retina at m' . The visual axis is $P.P.-m$, and the secondary visual line is $S.P.-m'$. Since these lines cross each other at the

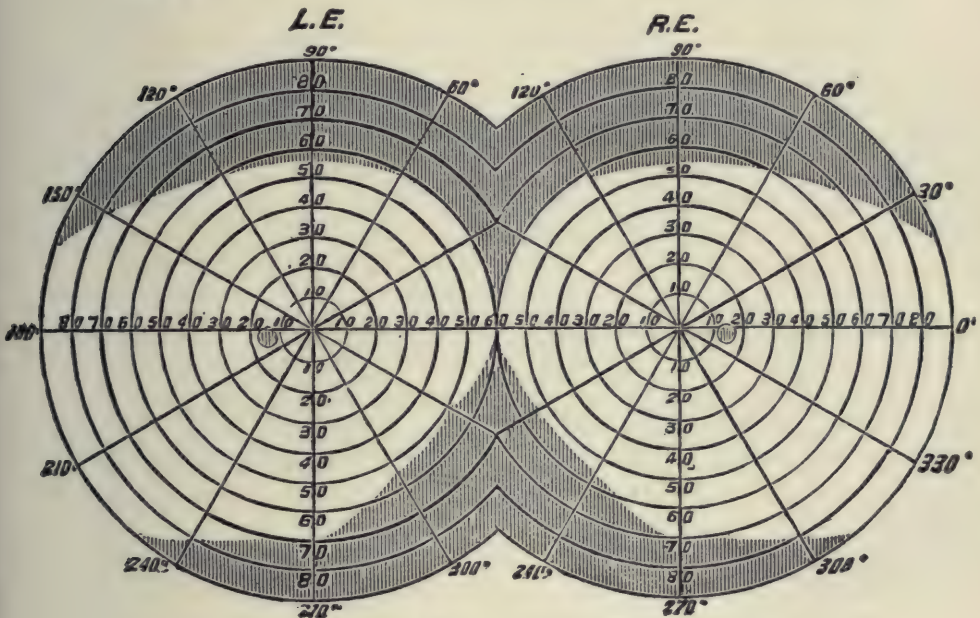
center of rotation and are radii of retinal curvature prolonged, the one can be made to assume the position of the other when the point of view is changed, and that, too, without disturbance, either apparent or real, of the fixed relationship of the two motionless points in space and their respective retinal images. This is in accord with human experience.

Returning to the ideal eye, shown in Fig. 2, the image of *S.P.* is not at *x*, but at *m'*, and the real secondary visual line is *S.P.-c-m'*, whose position the visual axis takes when the eye rotates from the primary to the secondary point of view. Thus Fig. 2 may be made to teach the truth, after erasing the continuous line *S.P.N-x* and the dotted line *d-r*, to the left.

In Fig. 3 I have shown Helmholtz's so-called optic axis *o-a*, and on it his nodal point, "useless each e'en with the other." The sooner they are forgotten the better, and the *angle gamma* should be included in the forgetting. The true posterior pole is the central point of the macula, the true optic axis is the visual axis, and the true anterior pole is that point of the cornea cut by the visual axis, whether it be the center of the cornea or not. An undeniable evidence that the central point of the macula is the posterior pole is the fact that all retinal meridians cross at this point—at the *crossing of the meridians is the pole*. There is no longitude there; and, likewise, there is no latitude for adverse argument.

The discovery of the true location of the posterior and anterior poles of the eye was a fortunate one, and I must be pardoned for feeling some joy in the achievement. On this discovery is based the law of monocular motion and of binocular rest and motion. In monocular motion every rotation plane is an extended meridional plane of the eye. Such a rotation is affected by one muscle only, if that muscle is bisected from origin to insertion by the rotation plane. When two, or, at most, three, muscles must affect a given rotation, their resultant action is that of an imaginary muscle which would have been bisected by the rotation plane. The law of binocular rest and motion cannot be better stated than in the following language: "The ocular muscles must so relate the two eyes that the two visual axes and the two horizontal retinal meridians shall always lie in the plane of the primary isogonal circle, and that the two visual axes shall intersect at some point on this circle, in the interest of both binocular single vision and correct orientation." The isogonal circle could not exist if the posterior pole were not the macula and if all lines of direction were not radii of retinal curvature prolonged.

I have recently discovered the binocular spacial pole, the value of which can be easily comprehended as I proceed. Figs. 4 and 5 show truths which we all have known, but have not fully appreciated. Fig. 4 shows the visual field of the left eye and much more. It shows the spacial meridians for the left eye which are in planes with the meridians of that eye; and at the crossing of the spacial meridians, on the line of the visual axis, is the spacial pole for the left eye. Fig. 5 shows the spacial pole and meridians for the right eye, and as clearly as it shows the visual field for that eye.

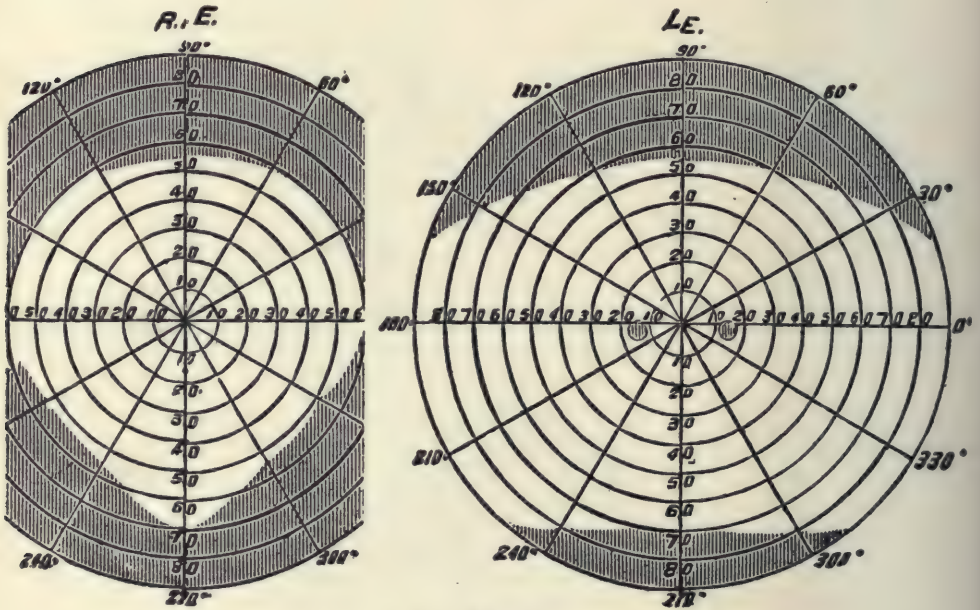


Figs. 4 and 5.

The spacial pole of one eye is the point of direct view for that eye and is therefore on the visual axis, hence, the three poles, the posterior, the anterior and the spacial, are all on the same straight line. In binocular vision the point of direct view lies at the intersection of the two visual axes, which means that the individual spacial poles have been fused, and thus has been created the binocular spacial pole so beautifully shown in Fig. 6. This figure also shows that the individual spacial meridians have also been fused into binocular spacial meridians. In like manner the two spacial fields of vision have been fused. The overlapping part of these two spacial fields, that is, the part of the combined fields in which both eyes see all objects, is shown in Fig. 7. This

figure also shows that there is no blind spot in that part of the field common to the two eyes.

The binocular spacial pole is movable in the four cardinal and in all oblique directions, as is true of the posterior and anterior poles of the eyes, and these always move through the same arc, the anterior poles and the spacial pole in the same direction, while the posterior poles go directly in the opposite direction. In convergence the anterior poles turned toward each other more and more as the binocular spacial pole approaches the face, while the posterior poles recede from each other.



Figs. 6 and 7.

The binocular spacial pole, lying at the intersection of the two visual axes, may be at any distance from the center of rotation. The primary position of the binocular spacial pole is at the point of intersection of three lines, viz., the two visual axes and the line of intersection of the extended vertical and transverse fixed planes of the head, and this is the primary point of view.

Viewable space for the two eyes is shown in Fig. 6 between the larger shadow above and the smaller shadow below. The point of direct view within this space must always be at the spacial pole; points of indirect view may be anywhere else in the visual expanse, but every one of these must lie on some binocular spacial meridian. The direct line of vision—the visual axis—lies in every

meridional plane—is the line of intersection of all meridional planes; every indirect line of vision—a radius of retinal curvature prolonged—lies in the plane of some one meridian. To be in the range of simultaneous view by the two eyes the secondary points must be somewhere in the balloon-shaped field shown in Fig. 7, but in whatever direction they may be, and however close to, or remote from, the pole, they all must lie on spacial meridians.

The purpose of the existence of the ocular muscles and the brain centers controlling them, is that the point of view may be changed. The field of possible rotation is not quite so large as the field of binocular vision shown in Fig. 7; but so nearly do the two correspond in scope, Fig. 7 may represent both. Within this space the ocular muscles may move the binocular spacial pole from point to point, but always along a binocular spacial meridian. This is true whether the starting point may be the primary point, or some secondary point.

Every monocular rotation plane contains three fixed points, viz., the center of rotation and the first and second points of view. There are also three movable points in every rotation plane, the posterior pole, the anterior pole and the spacial pole. It cannot now be denied that every monocular rotation plane is a meridional plane. The axis of any rotation cuts the center of rotation at right angles to the plane of rotation. The visual axis is the line guided by the recti muscles in rotation planes made steady by the oblique muscles. The visual axis is the line of intersection of all meridional planes. The only plane cutting the center of rotation at right angles to all meridional planes is the equatorial plane; therefore it must contain the axes of all possible ocular rotations. This being true, Listing's plane is valueless. It is not even a plane of reference. The planes of reference are the vertical and horizontal fixed planes of the head.

The binocular spacial pole should be in the primary position and at practical affinity (20 feet) in all tests for heterophoria, that is, the test object should be on the line of intersection of the vertical and horizontal fixed planes of the head. With no displacing prism before either eye the visual axes intersect at the test object, and this object becomes the binocular spacial pole. Displacing the image in one eye beyond the border of the fusion field, if the eyes are orthophoric, does not interfere with the binocular pole, for both axes still intersect at the object now seen by only the uncovered eye. As to the lateral recti muscles this is shown by the false object standing directly beneath the true when the retinal image has been displaced upward by a 6-degree prism, base up.

As to the superior and inferior recti, the orthophoric state is shown by the false object standing level with the true, the retinal image having been displaced nasalward by a 10-degree prism, base in. In both these tests the visual axis of the eye under test has continued to intersect its fellow at the test object, which object has remained the binocular spacial pole. When there is heterophoria it will be shown as to kind and amount by these tests. Displacing the image in one eye directly up 6 degrees takes every basal or fusion brain center off its guard, and the eye under test turns into position of rest for all the recti and also the obliques. But while the image is thus displaced only the internus and externus of that eye are to be studied. If the internus of that eye is too strong the spacial pole for that eye will leave the spacial pole of its fellow and will move towards the opposite side. The false object, although displaced directly downward, will appear to be removed towards the corresponding side. The rotary prism turned in the direction of the displaced pole will carry the false object in that direction until it reaches the vertical spacial meridian, when it will appear to be directly under the true object. If when the 10-degree prism has been placed, base in, before one eye, the superior rectus of that eye being too strong will carry the spacial pole of that eye up, and the false object will be below the level of the true. The rotary prism set for measuring such error can be made to carry the false object up until it reaches the displaced horizontal spacial meridian, when it will appear to be level with the true object. During the above tests of heterophoric eyes there has been no binocular spacial pole. On removing the phorometer the basal of fusion centers at once compel the weak muscles to pull the eye into harmony with its fellow, and thus they recreate the binocular spacial pole. The importance of one spacial pole remaining on the line of intersection of the extended vertical and horizontal planes of the head while measuring the swing of the spacial pole of the eye under test, has been emphasized in all my writings for the past twelve years. I have not spoken too strongly against the use of all binocular phorometers, which take both spacial poles away from this line in heterophoria and remove the binocular pole from it when there is orthophoria.

By taking a horizontal line for a test object the condition of tonicity of the obliques can be detected by placing a 6-degree prism, base up, before one eye. This will throw the retinal image of the line upward in that eye and a false line will appear under the true. The uncovered eye should fix the line seen by it; that is, the image of its line should lie on the horizontal retinal meridian

of that eye, thus making the line itself coincide with the horizontal spacial meridian. If the obliques of the eye under test have equal tonicity there will be no tilting of the spacial meridians of that eye and the false line will appear parallel with the true line. If the superior oblique of the right eye is wanting in tone the spacial meridians will turn on the pole as a pivot, and in the direction of the motion of the hands of the clock, and at the same time the false line will incline towards the opposite side. This declination cannot be measured by the rotary prism. To measure cyclophoria a binocular instrument is necessary.

If Helmholtz's anterior and posterior poles were correctly located, and if his nodal point had the right to exist, there could be no binocular spacial poles and meridians, except in the ideal eye. The spacial pole for each eye must be in a straight line with the poles of the eye, hence it would lie on the so-called optic axis extended. If the visual axis is 5 degrees nasalward for each eye, when these are converged the spacial poles will be 10 degrees apart, and there will be no coincidence of vertical and oblique spacial meridians.

EXHIBITION OF INSTRUMENTS

LACHRYMAL OBSTRUCTIONS TREATED BY ELECTROLYSIS—DEMONSTRATION OF NEW INSTRUMENTS.

DR. HERMAN JARECKY.
NEW YORK CITY.

As I am on the program only to demonstrate the use of my instruments for electrolysis to relieve stenosis of the lachrymal canal, I shall do so briefly, leaving the tabulation of cases for a future paper.

The armamentarium and method are simple and the whole procedure can be rendered painless.

The complete outfit consists of the following: The ordinary lachrymal syringe with a thin canula to wash out, or to inject cocain into the lachrymal canal, a galvanic battery with a milli-amperemeter, and a cord with an ordinary sponge holder of about six and a half meters in diameter. These we all have in our office equipment, so that the only special appliances are the cord, for the negative pole and the probes as per illustration. This cord is an ordinary one with the exception that it has on one end a thin piece of exposed copper wire one meter in length which fits directly into the end of the probe.

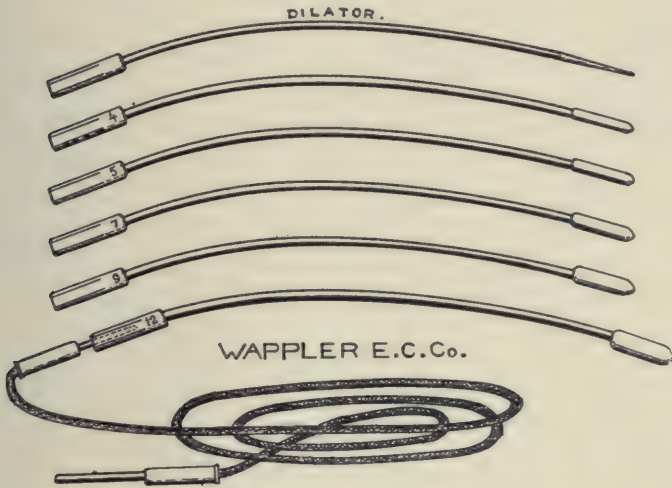
The probes are about eleven and a half mm. long and may be described as consisting of tip, stem and end. The tip is brass nickel plated and one and one-quarter meters in length, conical in shape both at its beginning and end where it fits firmly and closely to the stem. The stem, nine mm. long, consists of a bronze wire covered with the material used in the male catheters. The end is one and a half mm. long and consists of a hollow brass cylinder nickel plated, in which are made four slits equally distant apart, so as to grasp the wire of the negative pole which slips in firmly.

One probe, which I have called the dilator, begins with a pointed end the size of number one and gradually thickens to number three.

The conditions in the tear passages which are benefitted by the use of these instruments are strictures at the puncta, in the canaliculi or in the nasal duct, and a distended lachrymal sac.

The method of using these probes is as follows: If there is any discharge in the canal or sac, and if the canula can be inserted, normal salt solution should be used and all secretions washed out. Then about one-half dram of one or two per cent solution of cocain should be slowly injected. In three to five minutes the anesthesia is completed. The probe is applied at the punctum, and the sponge is held on the cheek against the malar bone on either side.

The electricity is then turned on, from one to three milleampères being usually sufficient. More than five should never be used.



The stricture is almost immediately passed, as the probes slip through easily and painlessly, following the same procedure as in the use of the ordinary steel sounds. For the lower lid pass the probe first vertically down through the punctum, then draw the cheek so as to tense the lower eyelid downward and outward, pass the probe upward and inward till it touches the inner side of the sac, then while holding the point firmly against it, raise the free end of the probe upward and the instrument will slip slowly and gradually through the sac and into the nasal duct.

The instrument is left in about three minutes, but this varies, in accordance with the density, length and situation of the stricture. Repeat the use of the probe at the end of three days and if necessary weekly until full dilation is effected. The instrument is only passed through the stricture, then withdrawn far enough to keep the thick part of the tip in the stenosed portion.

When a distended sac exists, I dilate by passing the dilator and drain through the canaliculi. For the past three years I have not had occasion to incise any case, thus completely avoiding fistulous tracts.

In using the instruments a too strong current will cause cauterization, obliteration of the canal and in consequence a lack of drainage with its accompanying troubles.

The probes are made in all the sizes of the ordinary lachrymal sounds. In using these instruments care should be taken that there is no separation of the tip from the material covered stem, so as to avoid lacerating the canal. There should be no bleeding. Vaseline either plain or cocainized can be used over the stem to lubricate.

Results: All strictures situated at the puncta, or in the canaliculi, if no sounds have been used, are cured absolutely, as well as those in the nasal duct which are not caused by exostoses.

When pus exists either in sac or nasal duct, the percentage of cures has been greater than by the other method.

The advantage of this simple method is, that there is no cutting, no pain, a far greater number of cures and the canal is left in its natural condition.

DISCUSSION.

DR. G. B. JOBSON, Franklin, Pa.:—Do you apply it but once and have the duct remain open?

DR. JARECKY:—In strictures in the upper part of the canal only two or three sittings may be required. In the other portions of the canal there may be repeated sittings. In the upper portions there have been no recurrence, but in the lower portions there has been trouble. I get 70 to 80 per cent of cures.

DR. JOBSON:—While I have never used this method, I use the Theobald probe, which I consider is the only properly made one, and I think my percentage of cures has been higher than 80 per cent, even in intractible cases in which there has been considerable pus formed. My method is to evacuate the sac with a syringe and inject cocain and adrenalin. The probes are used with gentle force, increasing the size every sitting until the largest is used, and even in cases where the bone is denuded and can be felt, the probe acts as a curette, and after some weeks the mucous surface becomes smooth, the dilated sac contracts, and the catarrhal discharge ceases. This, by stimulation of the mucous membrane from the probing and syringing of the canal and sac with a mild antiseptic, which should follow, as well as precede, the entrance of the probe.

DR. A. G. BENNETT, Buffalo, N. Y.:—Starr of Buffalo has used electrolysis for this trouble.

DR. J. C. McALLISTER, Ridgeway, Pa.:—There is one advantage which the speaker alluded to but did not emphasize, and that is that you do not have to slit the puncta. In using the large Theobald probe or any of the older methods, the puncta must be slit, which I regard as objection-

able, if you can get the patient well without. With electrolysis you can dilate the puncta and use as large a probe as possible in the dilated puncta, and get permanent results.

DR. JOSEPH BECK, Chicago:—Six years ago I read before this Academy the paper on the use of thiosimamin and electrolysis by Duel's method, in cases of stricture of the Eustachian tube. The thiosimamin was used in 15 per cent alcoholic solutions, by hypodermic method, which, however, caused considerable pain and some disagreeable toxic symptoms. For the past two years I have substituted fibrolysin (Merck.). One ampulla is injected intramuscularly every other day until ten injections are given, following which electrolysis or dilatations are carried out.

The pathology of lachrymal obstruction being the same, namely, cicatricial formations, as in Eustachian tube strictures, I believe the association of the hypodermatic use of fibrolysin with electrolysis would be of more value than the latter alone.

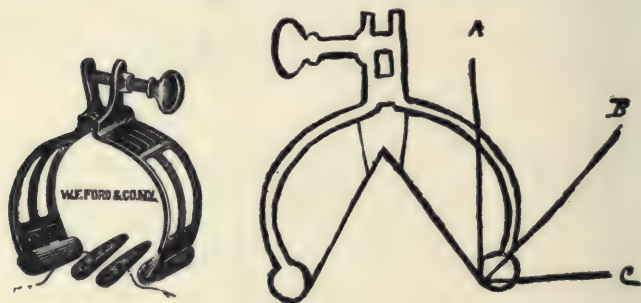
DR. JARECKY (closing):—Dr. McAllister hit upon the gist of the whole subject when he speaks of no slitting of the canula. The integrity of the lachrymal canal must be preserved, and also the elasticity. Some years ago I experimented with the tear duct in children at the morgue and found in almost all cases I could pass a 15 Theobald without breaking any of the bones. In using the steel probes I had my percentage of cures, but had to slit up the puncta. If the tear duct is to do its work, it must do it from this end; capillary constriction, pressure of the muscles, etc., is the method of nature to overcome this condition, and as soon as you cut you destroy this. And not only that, this method is so simple and painless that the patients do not hesitate to come back for their treatment and do not suffer the agony in passing in the larger probes.

DEMONSTRATION OF AN ORIGINAL BRIDGE AND INTRA-NASAL SPLINT FOR THE CORRECTION OF DEPRESSED DEFORMITIES OF THE NOSE.

WILLIAM W. CARTER, A.M., M.D.
NEW YORK CITY.

The bridge consists of two fenestrated wings joined by a hinge; the distance that these wings can be separated is regulated by a thumb screw. The edges of the wings are padded with rubber tubing and near the edges are several small holes that admit of gauze padding being stitched on. The second part of the instrument consists of two small hard rubber splints perforated by four small holes.

The instrument is devised on strictly mechanical lines, and is intended to duplicate the forces employed by Nature in the devel-



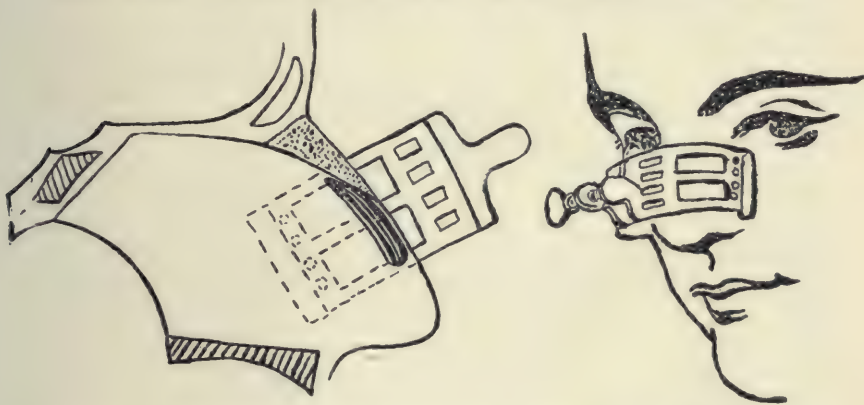
opment of the flattened nose of the infant into the more shapely organ of the adult.

We will assume that we have either a recent fracture or that the tissues have been mobilized in an old deformity.

A large curved needle is threaded with No. 14 silk, the other end is passed through one of the small holes in the hard rubber splint and knotted. The needle is then passed up through the cartilaginous dorsum of the nose near its junction with the end of the nasal bone; the operation is repeated on the opposite side. The bridge is then applied over the nose and the wings adjusted by means of the thumb screw to support the base of the nasal triangle. The sutures are passed through the fenestrae of the bridge corresponding vertically to their exit from the nose. The bridge of the nose is then pulled up into its

proper position, the sutures are crossed over the hinge of the bridge and tied together. The deformity having been reduced, the bridge is allowed to remain on the nose for ten days or two weeks. The nose is sprayed once a day with Dobell's solution, and sterilized petrolatum is introduced into the nose at night. The patient may remain in bed or adhesive plaster attached to the forehead may be used to steady the instrument when the patient assumes an upright position.

I have been able to bring but one patient here for your inspection. This boy, 14 years of age, had an accident in May, 1908. His nose was broken and he had considerable deformity both internal and external. There was almost complete obstruction of both cavities by a very thick septum which was deflected somewhat to the left, and on the left side an unusual amount of over-

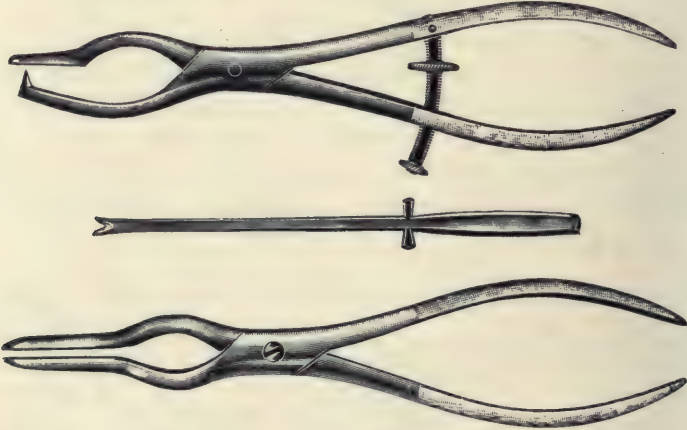


riding of the nasal bones, producing a large hump. There was also some over-riding on the other side. These casts represent the condition of the nose before and after the operation, which was done in December, 1908, seven months after the injury. The bridge was applied in the usual manner, but in this case the septum was too short to permit of the bridge being raised, so I introduced this procedure: With a small scalpel I made an incision diagonally through the septum, beginning near its base on the left side and emerging near the roof of the opposite nasal chamber. This permitted me to raise the bridge by allowing the two segments of the septum to slide by each other. I could thus raise the bridge of the nose without perforating the septum, for the two portions of the septum did not slide far enough to leave an interval.

The operation of mobilizing the bony parts of the nasal arch I will describe at this point. This chisel of special design is intro-

duced into the nose and the edge is placed against the edge of the nasal process of the superior maxilla. This is chipped off on each side and is to be used in building up the bridge.

The chisel forceps is used in liberating the nasal bones. In applying it the chisel blade is introduced into the nose, the flat external blade being padded with rubber tubing to protect the skin.



When the entire bony structure of the nose is mobilized, the parts are drawn into their proper position by means of the bridge and splints.

Where the anterior portion of the septum is too short, the tip of the nose is elevated by means of the operation shown in the accompanying cuts.

This apparatus is recommended in recent fractures where there is a tendency to displacement after the adjustment of the parts, and for all deformities after the parts have been mobilized.

The instrument should not be used where there has been extensive destruction of the bony parts of the nose from either traumatism or disease.

DISCUSSION.

DR. WM. L. BALLENGER, Chicago:—I have been much interested in this presentation, and regard it as perhaps the most accurate way we have of holding the nasal bones in place. I have not been using this method, and have had, no doubt, trouble which would not have occurred with this improved method. I have fractured the dislocated nasal bones and malar processes without the chisel, making an incision over the anterior ends of the turbinated bones, and then with an elevator inserted under the skin and periosteum of the nasal bones, have elevated the skin and periosteum. A stout forceps (Steele's) was then introduced, one blade through the incision to the external aspect of the nasal bone, the other

within the nasal chamber, and grasping one blade outside, then forcibly fracturing the bone. Then, in order to hold the bone in position, I have packed high up in the nose under the nasal bone very tight. This is not a very good method, although I have been fortunate in having success with it. Carter's method is much better and I want to speak in favor of it.

DR. GLEASON, Philadelphia :—I have had a certain number of these cases that I have operated on by various methods and have a special forceps, one blade of which is introduced inside the nose and the other underneath the skin, and thus split the nasal bones from the superior maxilla. There are very few noses that cannot be fractured in this way. In getting support for these cases, I have used a splint made of gauze to which is applied collodion. It is not very satisfactory and requires to be held by sticking plaster. I should think this instrument is a great improvement over any previous method.

DR. JOSEPH BECK, Chicago :—I have listened with great interest to this demonstration in Pittsburg some time ago when I read my paper on external nasal deformities. I want to say, as Dr. Carter asked if any had used this, that I have and found it all right in two cases.

DR. CARTER (closing) :—I feel much encouraged in having these testimonials of merit presented, and I hope ere another year there will be still more evidence in favor of treating nasal deformities by this method. I wish you all to understand, however, that I do not claim perfect results in all cases. The time allotted me has not been sufficient for me to report the cases I have operated on, so I must be content with offering these casts for your inspection. They represent the condition before and after the operation. In six cases the results are approximately perfect, three are improved, and two are failures, as far as the bridge splint is concerned, due to lack of bony tissue with which to build up the nasal arch.

In mobilizing the tissues I prefer the chisel, because it is impossible to mobilize the nasal processes of the superior maxillae by use of the Adams forceps. There is little or no danger of splitting into the lachrymal canal, because it is about five-eighths of an inch beyond the anterior border of the nasal process of the superior maxilla.

The scarring that remains after the operation is practically nothing, as you can see by the patient.

The discomfort experienced while wearing the instrument is very little indeed and is not complained of.

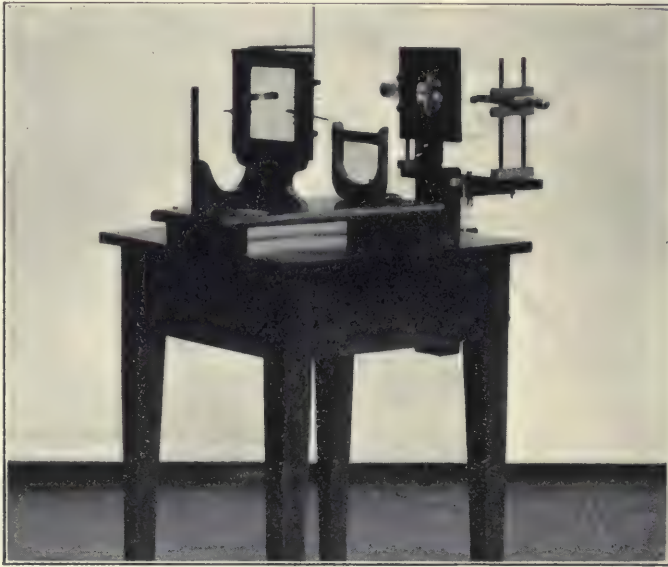
The greatest advantages that this method of treatment offers are that it reduces the deformity by a replacement of the tissues, it restores the integrity of the nasal chambers and leaves no foreign substance in the tissues.

AN IMPROVED APPARATUS FOR LOCALIZING FOREIGN BODIES IN THE EYE AND ORBIT.

GEORGE SLOAN DIXON, M.D.

NEW YORK.

This apparatus is mounted permanently on a table twenty-two inches square. It has a vertical plate holder sufficiently large to accommodate a 4 x 5 plate in its envelopes which is erected on a platform elevated by cleats to compensate for the shoulders of the ordinary sized patient. Any change desired in the elevation of the head and shoulders can be made by the use of sand bags. The plate holder is supplied with the usual cross wires and a



spring to retain the plate in position during exposure. A mouth gag of aluminum is attached to the face of the plate frame with a "jamb nut" to hold the patient's head steady. A clamp is supplied with the apparatus for the purpose of giving additional stability to the head in case the operator cares to employ it. It is also supplied with a means of fixing the vision, consisting of a steel rod mounted on the edge of the frame. It is capable of rotation, and has a sliding cross-piece of brass tubing at the top. Through this sliding tube a thread is run, and at the end of the

thread is attached a little woolen ball balanced by a piece of lead at the other end of the thread. Both the rod and cross piece can be fixed by set screws and the two motions are all that are required for adjustment. An upright sight is fastened to the outer end of the platform; the lower part of the notch is at the exact height of the cross-wire center.

This form of head rest has been in use for five years at the New York Eye and Ear Infirmary, and has proven highly satisfactory in every respect.

The tube holder is new. It consists of a box 2 x 3 inches inside measurement, open at each end, which is fastened to the rail of the table. Within this box moves a pillar controlled by a worm gear operated by a crank from the opposite side of the table. Attached to the upper end of the pillar is a diaphragm of zinc adjustable for height and supplied with cross threads for alignment with the cross-wires in the plate frame—not really necessary, but convenient. A projecting arm, one end of which is mortised into the head of the pillar, carries a cross-piece to which is attached the arrangement for clamping the X-ray tube. Both the arm and the cross-piece are slotted so that the parts supporting the tube can be moved in all necessary directions and clamped. It will suitably support any form of tube made at present. The arm is graduated so that it is possible to read off the distance of the center of the target from the plate at any time, thus rendering actual measurement unnecessary.

The face of the upper end of the pillar and the lower end of the diaphragm are graduated in centimeters, six above and six below zero.

Attached to the side of the box is an adjustable indicator to measure the distance the tube has been moved.

The entire apparatus is attractively finished, comparatively light and can be easily reversed (for right or left exposure) and placed in contact with any form of X-ray table which may be in use. At the same time everything is rigid and new adjustments are unnecessary so long as the tube "holds up" or is not required for some other purpose. This saves time and minimizes the personal equation errors of the operator.

The method of plotting the location of foreign bodies will be found described in a paper "On the Localization of Foreign Bodies in the Eye and Orbit," published in the New York Eye and Ear Infirmary Reports of 1906.

DISCUSSION.

DR. McREYNOLDS:—Where can this be obtained, and the cost?

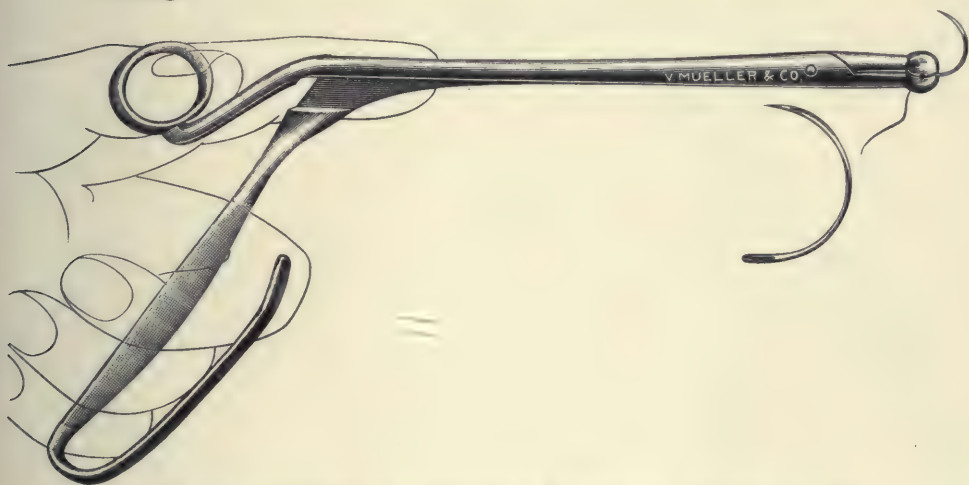
DR. DIXON:—The apparatus is made by the Wappler Electric Controller Company, New York. As to the price, I do not know. I have been using one at the infirmary for some time, and we rushed this one through to get ready for this meeting, and I do not know whether the Wappler people have computed the cost of the apparatus or not.

A NEW PHARYNGEAL NEEDLE HOLDER. DESIGNED
ESPECIALLY FOR SUTURING THE TONSILLAR
WOUND AFTER TONSILLECTOMY.

JOHN O. McREYNOLDS, M.S., M.D., LL.D.

DALLAS, TEXAS.

With the substitution of complete tonsillectomy for the simpler but inadequate tonsillotomies of former years, there must necessarily develop an increasing danger from post-operative hemorrhage. That the extirpation of the tonsil involves great responsibility is generally recognized, and we are now concerned with the adoption of such methods as will minimize the risk from hemorrhage.



The ineffectiveness of the various styptics and the pain of prolonged pressure by tonsil hemostats are fully appreciated by all. There is, however, another expedient whose value has never been generally recognized. This consists simply in suturing firmly the tonsillar wound to a sufficient extent to close up all denuded bleeding areas. This may require from one to three sutures, according to the nature of the case, and the stitches may include simply the two pillars of the fauces, or they may include within their grasp the tissues at the base of the tonsillar excavation.

The suture material which I have found best is a large size of black braided silk. The needles which have proved most satisfactory have been of the Hagedorn variety and of the size and curvature shown in the diagram presented herewith.

But the factor of greatest importance in the prompt and easy introduction of the sutures is the needle holder. After using for this purpose all of the usual forms of needle holders, I was led to devise the one illustrated herewith.

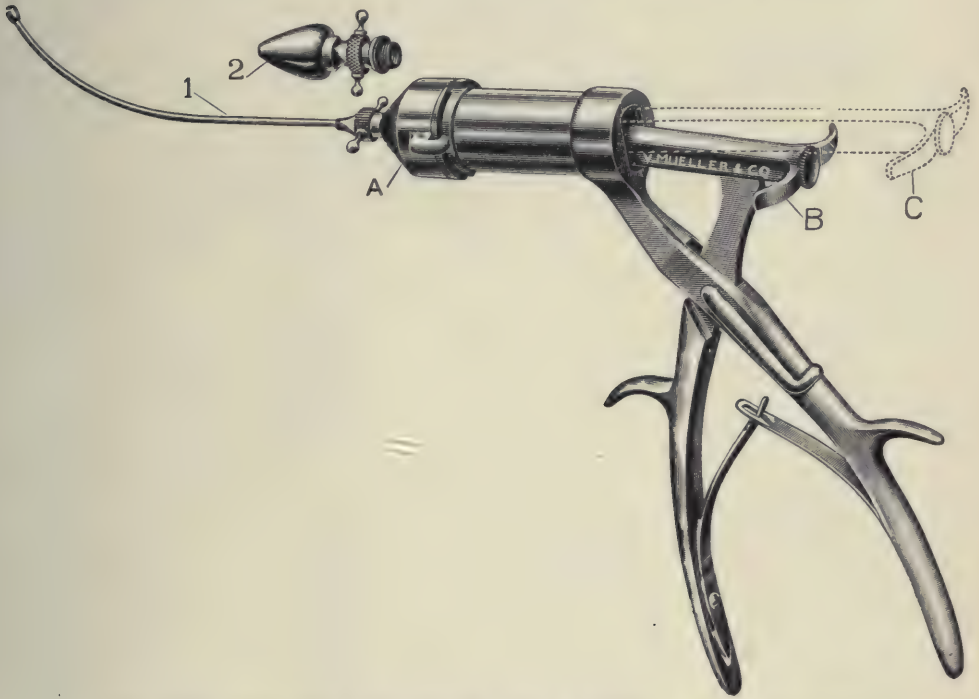
The handle must be so placed that the hand of the operator is always out of the field of vision. The instrument should be able to hold the needle firmly without the use of a lock, because it is essential to release the needle quickly after it has penetrated the tissues, so that with the same instrument the point of the needle may be grasped immediately and pulled through before the gagging of the patient can dislodge the needle. The grasping surfaces of the instrument should be provided with notches or grooves so that the Hagedorn needles with large eyes can be easily maintained in any desired position. The grasping surfaces of the distal end should present a concavity so that a curved needle may be securely held without incurring the risk of being broken, which would at least be an embarrassing accident in the midst of an operation on a throat filled with blood.

BISMUTH SYRINGE.

JOSEPH BECK, M.D.

CHICAGO, ILL.

Last year I presented before this Academy a syringe for the purpose of injecting the accessory sinuses of the nose and the middle ear cavity with bismuth paste, the medicinal value of which I need not describe at this time. A number of gentlemen



who have employed this method, and I myself, have found considerable difficulty in the management of that syringe. Besides it required an assistant. Consequently I had Mueller & Co. construct this instrument (Fig. 1), which obviates all the difficulties encountered by the first instrument and has a number of improvements in addition.

PHARYNGOSCOPE.

HAROLD N. HAYS.

NEW YORK CITY.

I shall pass around a series of illustrations which show some views of the nasopharynx and larynx, and which will give you an idea of the beautiful view we get with the pharyngoscope. I have no doubt you understand that the instrument is mainly for the examination of the nasopharynx, but the laryngeal views are well worthy of study. The instrument has a handle, a telescope

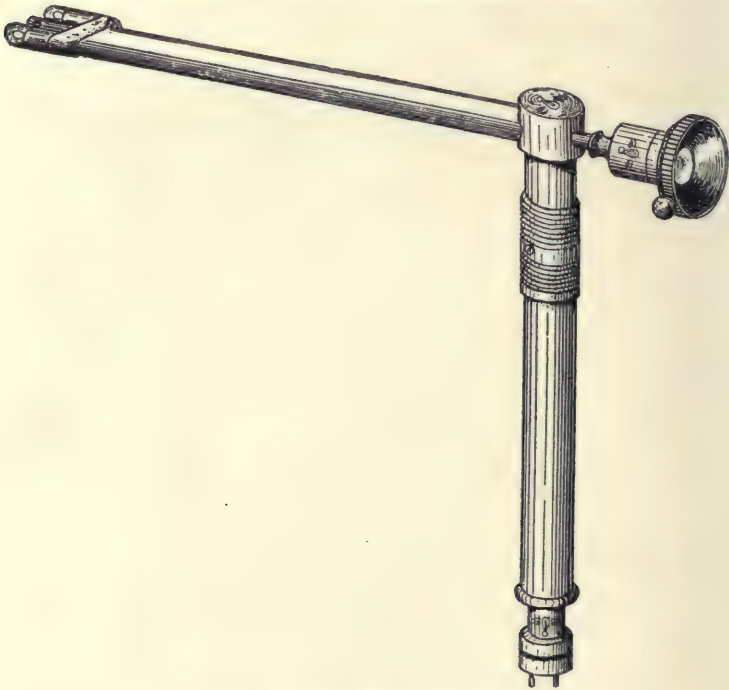


Fig. 1. The Hays Pharyngoscope.

and a series of electrical connections. The telescopic portion is on the principle of the cystoscope, reflects an image at right angles and has the eye-piece at the outer end. This is inserted into the horizontal shaft, the handle is screwed on, making a right-angled instrument which can be used the same as a tongue depressor. The instrument is inserted into the oral cavity until the inner end is about one-sixteenth of an inch from the pharyngeal wall. The mouth is closed and the electric light is turned

on by means of a little switch on the handle. When the lens points up a beautiful view of the pharyngo-nares is shown. As a rule both Eustachian tubes are seen. If not the lens can be rotated either way until they show. In order to see the larynx the



Fig. 2. Examination by means of the Pharyngoscope with mouth closed.

ball on the handle is merely turned down. In some instances the larynx is not presented as a whole, but with a little manipulation one is able to get the entire picture. The electrical connection

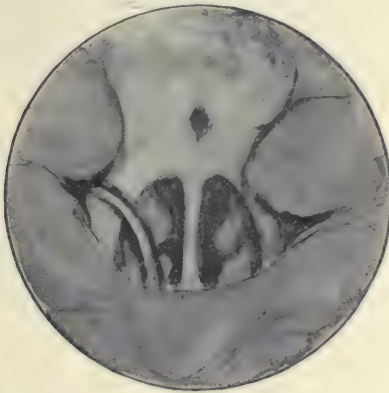


Fig. 3. Showing the Eustachian catheter in the right Eustachian tube.

is made by means of wires to a rheostat or dry cell battery. The instrument should be used carefully and not jerked about on the tongue, as clumsiness will immediately gag the patient. As an illustration of one of the uses of the instrument, let me men-

tion an infiltration anesthesia for adenoids by the use of a one-quarter of one per cent solution of cocain, injected with a long

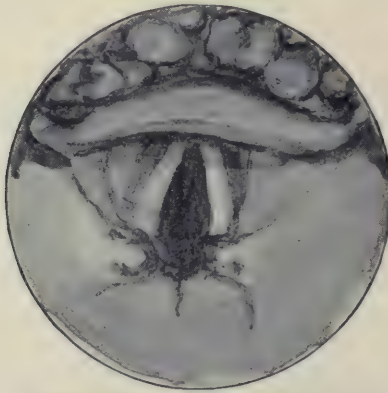


Fig. 4. View of a normal larynx. Note the ease with which the anterior commissure is seen.

needle passed through the nose. By means of the pharyngoscope the site of injection can be seen. On removal of the adenoid, there is practically no pain or bleeding.

PRESENTATION OF INSTRUMENTS FOR THE RE-
MOVAL OF THE MIDDLE TURBINATED BODY,
ETHMOID CELLS AND POLYPI
EN MASSE.

WILLIAM LINCOLN BALLENGER, M.D.

By reference to the following drawings the technique required to remove the middle turbinated body and ethmoid cells en masse will be explained. Fig 1 shows the three positions the handle of

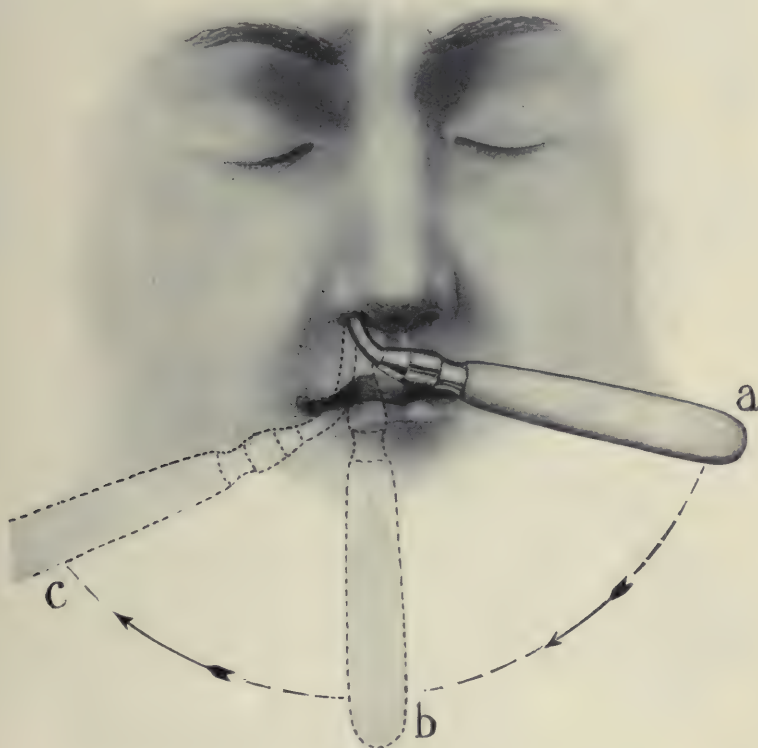


Fig. 1.

the knife must assume in the successive stages of my operation.

(a) First position, or the one used to introduce the instrument through the nasal chamber until the right angle short blade impinges against the anterior wall of the sphenoid cavity.

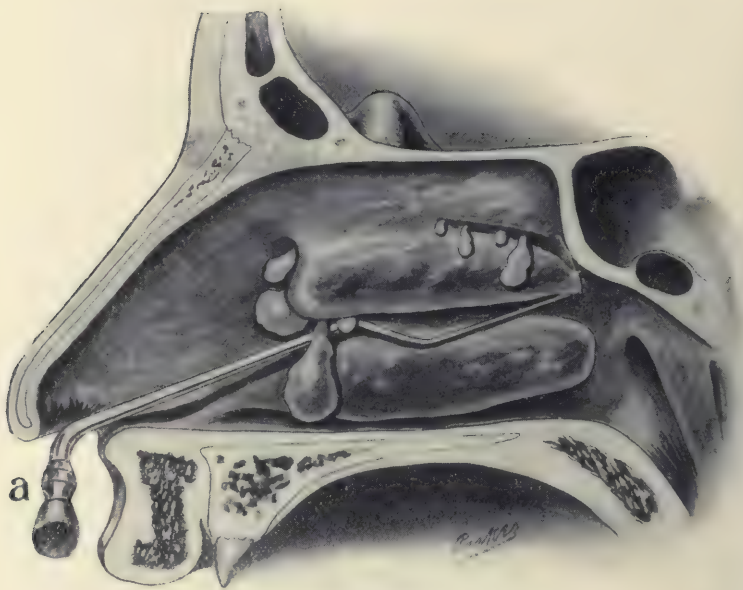


Fig. 2.

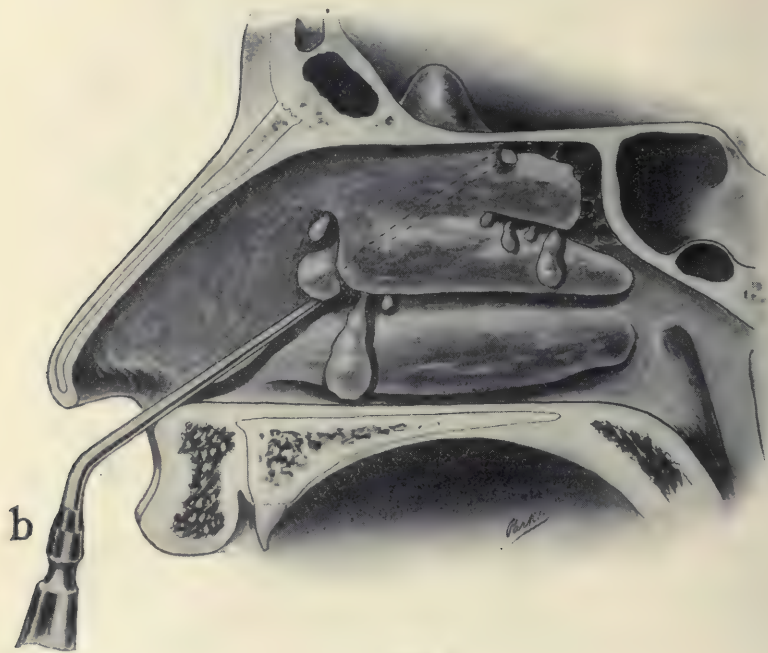


Fig. 3.

(b) The second position, in which the short blade severs the attachment of the posterior ethmoidal cells from the sphenoid and the long blade the orbital attachments.

(c) The third position, in which the short blade is turned downward and the anterior attachment of the middle turbinated body is severed. This position is necessary on account of the narrowness of the nasal chamber anteriorly.

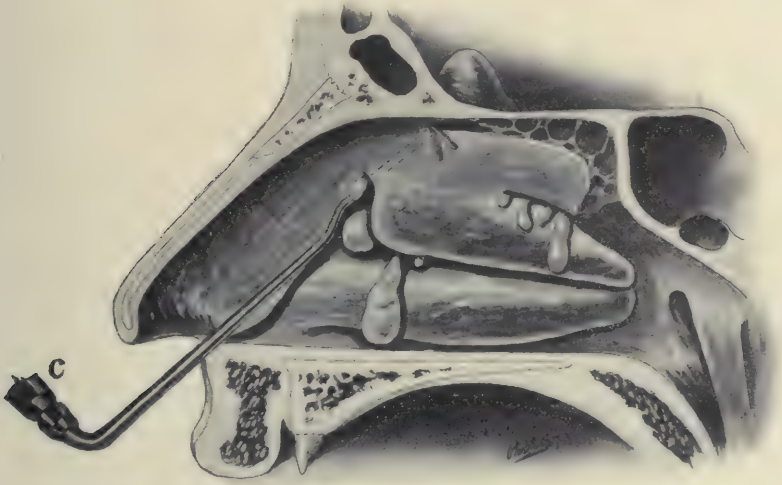


Fig. 4.

Fig. 2 shows the instrument (intranasally) in first position with the short blade against the anterior wall of the sphenoid.

Fig. 3 shows the instrument in the second position in the process of severing the frontal and orbital attachments of the ethmoid.

Fig. 4 shows the instrument in the third position preparatory to severing the anterior attachment.

This operation is designed for those cases in which it is necessary to make a complete exenteration of the ethmoidal cells, and should only be used when such indications are present.

DR. OTTO J. STEIN, Chicago:—I have here two instruments handed to me by Dr. Baker, sent by Dr. Large, who has been prevented from attending, and he wanted to know if I would present them, simply to show the members. They are evidently tonsil instruments.

CATARACT IN CAPSULE DETACHER.

G. C. SAVAGE, M.D.

NASHVILLE, TENN.

It is a double instrument, that is, right-handed and left-handed. Each end terminates in two curves, the radius of which should be the radius of the anterior surface of the cataract. The one curve is in line with the handle of the instrument and the other at right angles to this line. In doing the operation the eye should be firmly fixed by a grasp of the tendon of the internal rectus. The forceps thus held are not at all in the way of the



knife in making the corneal incision. If an iridectomy is to be done, the operator should still hold the eye by the tendon grasp, while he seizes the iris and draws it out through the wound, at which time he asks an assistant to clip, with the iris scissors, close to the end of the iris forceps. Still holding to the tendon, the detacher should be inserted so that the point of the horizontal curve shall pass through the pupil behind the iris, and then the instrument should be carried down until both the horizontal and vertical curves and their point of union are between the iris and the cataract.

The first movement is effected by the rotating instrument so as to make pressure with the vertical curve, pushing back the outer edge of the lens, while the inner edge is made to advance correspondingly. The cataract has thus been rotated on its vertical axis, the result being the tearing loose of ligaments on both sides, almost from top to bottom. Returning the instrument to its primary position, the next movement is to make pressure with the horizontal curve against the lens below the center, pushing back its lower margin and making the upper margin advance accordingly. This finishes the tearing loose of the ligamentous attachments, and the detacher should be removed. Now the Daviel spoon can be used in making pressure on the lower part of the cornea, when the lens, if entirely freed from attachments, will easily present itself in the incision, while the eyeball is still fixed with the tendon grasp. If the external pressure shows that some ligaments have not been torn loose, it is better to lay the fixation forceps down, and taking into one hand the cystotome, counter

pressure should be made above with its shank, while the pressure is made below with the back of the Daviel spoon. At the moment that the lens presents itself well into the incision, the counter pressure should cease, and to lighten the pressure below, the cystotome should be turned, so that its point can be made to transfix the cataract from behind, by means of which the lens can be lifted out of the eye, greatly lessening the danger of the escape of vitreous.

OBITUARY NOTICES

Robert Marcus Gunn, M.A., M.B., C.M. (Edin.), F.R.C.S. (Eng.), whose death is so deeply deplored by his professional brethren, passed away on November 29, 1909, after a painful and distressing illness borne with splendid courage. Descended from an old Norse stock, he was born at Dunnet, Sutherlandshire, in 1850, and was the last survivor of a family of two sons and two daughters. He received his early education at the late Mr. Thomas Fraser's school at Golspie, and proceeding subsequently to Edinburgh University he graduated there with distinction, obtaining the degree of M.A. in 1871 and that of M.B., C.M., in 1873. The history of his professional life and achievements has already been told by those who knew him well. Here we can only give a brief record.

Gunn's professional career was very closely associated with the Moorfields Eye Hospital, to which institution he was deeply attached, and to which he gave many years of willing and valuable service, not less valuable in reference to teaching than in the care of patients.

At the time when he became incapacitated by his last illness, Gunn was senior surgeon to the hospital. He was also ophthalmic surgeon to the National Hospital for the Paralyzed and Epileptic, and in July last completed his term of office (two years, as president of the Ophthalmological Society of the United Kingdom). Greatly to the sorrow of its members, he was unable to occupy the chair at the last few meetings of the society over which he had presided so ably and so successfully.

Gunn's connection with Moorfields Hospital began in 1873, when he became a student there, attending especially Mr. Couper's practice. From December 1874, to June, 1875, he studied in Vienna under Jaeger, a period of studentship of which he retained very happy memories. In August, 1876, he was appointed junior house surgeon, and in December of the same year, senior house surgeon to Moorfields Hospital. The latter post he occupied for two years. He was an extremely efficient house surgeon, and during his term of office many important and lasting reforms were effected in the hospital work.

In 1882 Gunn obtained the diploma of F.R.C.S. (Eng.). He was elected assistant surgeon to Moorfields Hospital in 1883 and surgeon in 1888. In 1886 he was appointed ophthalmic surgeon to the National Hospital for the Paralyzed and Epileptic.

In 1898 he was vice-president of the Section of Ophthalmology of the British Medical Association, in Edinburgh, and in 1906 he was president of the same section at the meeting of the association in Toronto. In the same year he delivered an address before the American Academy of Ophthalmology and Oto-Laryngology. In 1907 he delivered an interesting address on the value of Ophthalmic symptoms in general diagnosis and prognosis, and had arranged to take part in the Belfast meeting of the British Medical Association, but was too ill to attend.

Gunn was not a voluminous writer, but published a considerable number of papers, chiefly in the Transactions of the Ophthalmological Society, and the Ophthalmic Hospital Reports. He was also the

author of several important articles on the Eye, in Treatises on Surgery and Anatomy, etc. His published papers all bear the stamp of great care and accuracy in their preparation and are written with marked attention to clearness of expression.

Gunn was greatly beloved, and respected in an equal degree, by those who knew him. Mr. Nettleship, to whom we are indebted for much of the information in this notice, writes in these words: "Marcus Gunn's character might be described as little removed from that of the perfect knight—courageous and pure in mind and body, modest, but clear and strong in his convictions, sweet of temper, ready always to see the better side, scrupulous in giving credit where credit was due. He was a man of considerable intellectual gifts and brain power and an exceedingly keen and accurate observer; his mental grasp was strong, his judgment careful and well-balanced; a certain matter of fact simplicity was set off by a ready sense of humor. His influence with colleagues, students, and patients depended largely on the conviction that he was true and loyal to the core and never satisfied with slipshod methods or imperfect knowledge. Himself singularly guileless he was a good judge of character and motives in others."

(Ophthalmic Review, January, 1910.)

Dr. Jacob E. Schadle. It becomes our sad duty to record the loss this society has sustained in the death of the following active member: Dr. Jacob E. Schadle, of St. Paul, Minnesota.

Dr. Schadle died of cerebral thrombosis, followed by general paralysis, after a brief illness, on May 29, 1908. He was born of German parents, on June 23, 1849, in central Pennsylvania, and graduated in Jefferson Medical College in 1881. His early practice was in central Pennsylvania, and at Shenandoah, Pennsylvania, in 1889 he established himself in St. Paul.

While acting as lazaret physician at Shenandoah, he made a record for himself by the skill, wisdom and courage which he displayed in the handling of a widespread epidemic of smallpox, stamping out the disease.

In 1885 he reported the successful treatment of three cases of mushroom poisoning, by the administration of large doses of atropine, a method that was original.

He was a pioneer in his specialty in the Northwest, was a skillful operator, and originated a number of surgical instruments of great value.

Dr. Schadle was well known as a frequent, highly valued contributor to the medical journals of this country, which gave evidence of scientific knowledge that was thorough, coupled with a strong desire to elevate his profession, freely giving his very best to that end. Among his recent contributions were: The report of cases of membranous laryngitis as a complication of influenza, and the relation of antral sinusitis to hay fever and asthma. The contribution on accessory thyroids at the base of the tongue was a most valuable one.

He had traveled much, visiting most of the European clinics, where he carefully noted the work done, making comparison with his own, and that of others, and selecting that which he found the most valuable.

He was an enthusiastic student of those diseases connected with his special line of work, and imparted his knowledge to his students in the medical department of the University of Minnesota where he, was professor of diseases of the nose and throat.

In addition to fellowship in this society, he was a member of the Ramsey County Medical Society, the Minnesota State Medical Association, and presided at one time over the Western section of the American Laryngological, Rhinological and Otological Association.

His wife, a daughter of Dr. D. H. Miller still survives him.

While Dr. Schadle was a specialist in diseases of the nose and throat he was interested in everything pertaining to every branch of medicine and he stood for everything that was highest and best in the profession, which he loved so well, and for which he had done so much.

We were first attracted to Dr. Schadle by the strong character of his scientific work, and soon learned to admire his many sidedness. He was strong and fearless in the courage of his convictions, slow to find fault, and forgiving to a great degree. Genial in his temperament, liberal in his disposition, and lovable to such an extent that his decease makes all those who knew him best feel a sense of personal loss, and every tribute of respect to his memory, and respectful condolence to his surviving helpmate and comrade, but weakly expresses our admiration for the man, the physician and the friend.

Dr. Alfred Hunter Voorhies was one of the older members of the Academy, and died at San Francisco, California, May 5, 1908, aged seventy years. He was a graduate of the University of Pennsylvania in 1860. He was a surgeon in the Confederate service during the Civil war, and at the close of the war gave special attention to diseases of the eye. Death was caused by cerebral hemorrhage. (A. M. A. Jour.)

Frank Bradford Sprague, M.D. University of Vermont, Burlington, 1889; a member of the American Medical Association, New York Academy of Medicine, American Otological Association, American Laryngological, Rhinological and Otological Society; and American Academy of Ophthalmology and Oto-laryngology; surgeon to the ear, nose and throat department of Rhode Island Hospital, Providence; and aural surgeon on that staff; well-known as a specialist of diseases of the ear; died at his home in Providence, November 17, from septicemia, due to an operation wound, aged 44. (A. M. A. Jour.)

Samuel Benedict St. John, M.D. College of Physicians and Surgeons, New York City, 1870; a member of the American Medical Association; secretary of the Connecticut State Medical Society from 1883 to 1888; secretary of the American Ophthalmological Society from 1888 to 1908, and president in 1909; a member of the American Otological Society and American Academy of Ophthalmology and Oto-laryngology; president of the New England Ophthalmology Society in 1890-1891; a fellow of the New York Academy of Medicine; consulting ophthalmic and aural surgeon to St. Francis Hospital, Hartford, and Litchfield County Hospital; visiting ophthalmic and aural surgeon to the Hartford Hospital; a director of the Hartford Public Library; lecturer on ophthalmology in Yale University, New Haven, from 1881 to 1905; died suddenly at his home in Hartford, December 21, from angina pectoris, aged 64. (A. M. A. Jour.)

Dr. Ferdinand C. Hotz died at his home near Chicago, Morton Grove, Ill., on March 21, 1909, from pneumonia complicated by heart disease. In 1865 Dr. Hotz was graduated from the University of Heidelberg; in 1866 he was army surgeon in the Prussian-Austrian war. Dr. Hotz, after a thorough apprenticeship under the most

famous European teachers, located in Chicago in 1869, where he was appointed oculist to the Cook County Hospital and the Illinois Charitable Eye and Ear Infirmary. In 1898 he was made professor of ophthalmology and otology of Rush Medical College. He was one of the founders of the Chicago Ophthalmological Society, and was associated with the Ophthalmic Record in its early days as one of the editors. Dr. Hotz's fame will doubtless chiefly be upon the very ingenious plastic operations upon the eyelids which have made his name familiar throughout the civilized world. (Ophthalmic Record.)

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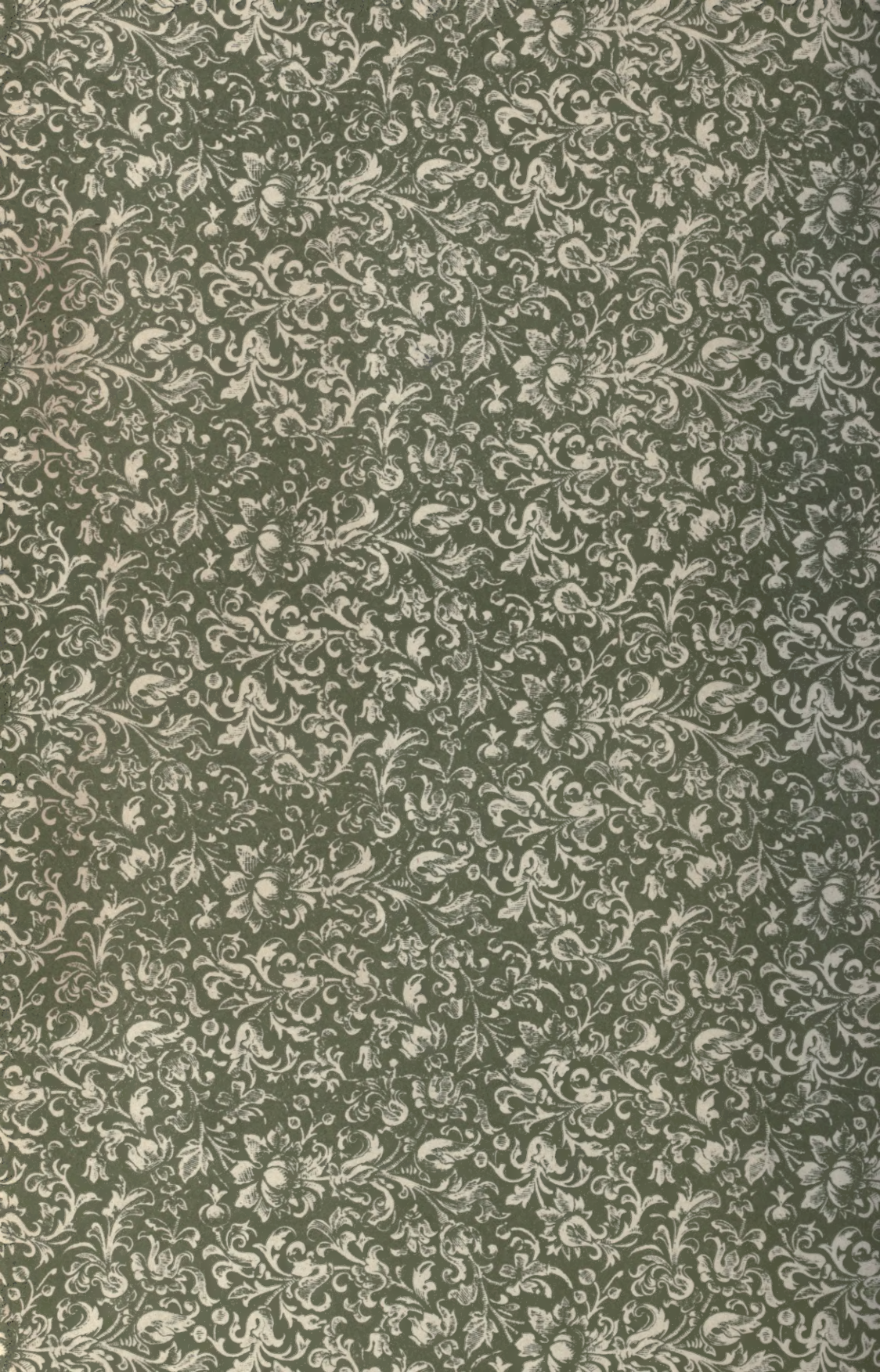
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*Minor, Chas. L.	9½ E. Main St., Springfield, O.
*Mittendorf, Wm. F.	141 Madison Ave., New York City, N. Y.
Monosmith, O. B.	314 Broadway, Lorain, O.
Moore, Mead.	The Rochambeau, Washington, D. C.
*Moore, T. W.	Huntington, W. Va.
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*Nance, Willis O.	100 State St., Chicago, Ill.
Neeper, Ed. R.	46 P. O. Office Bldg., Colorado Springs, Colo.
Neres, F. E.	219 Commonwealth Bldg., Denver, Colo.
Newhart, Horace.	502 Pillsbury Bldg., Minneapolis, Minn.
Norris, Sam'l C.	1016 Meridian St., Anderson, Ind.
Noyes, Guy L.	Columbia, Mo.
*Nye, F. T.	Beloit, Wis.
Oatman, Edmond Le Roy.	82 Remsen St., Brooklyn, N. Y.
Odell, Anna.	32 Adams St., Detroit, Mich.
Offutt, W. N.	Lexington, Ky.
Oppenheimer, Seymour.	45 E. 60th St., New York City
Outwater, Sam'l.	8th and Main Sts., Riverside, Cal.
*Owen, F. S.	209 Karback Blk., Omaha, Neb.
*Page, Lafayette.	224 N. Meridian St., Indianapolis, Ind.
Park, John Walter.	32 N. 2d St., Harrisburg, Pa.
Parker, H. C.	320 Meridian St., Indianapolis, Ind.
Parker, O. T.	Salida, Colo.
*Parker, V. H.	Carmi, Ill.
*Parker, Walter.	912 Chamber of Commerce, Detroit, Mich.
Patterson, James A.	309 N. Tejon St., Colorado Springs, Colo.
Payne, A. L.	Eau Claire, Wis.
Payne, S. M.	542 Fifth Ave., New York City
Pearson, W. W.	417 Equitable Bldg., Des Moines, Iowa
*Pendleton, F. M.	5th and Hampshire Sts., Quincy, Ill.
Peters, Walter H.	606 Columbus St., Lafayette, Ind.
Pfafflin, Chas. A.	Newton Claypool Bldg., Indianapolis, Ind.
Phillips, W. C.	40 W. 47th St., New York City

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 Phinney, Frank D.....22 W. 70th St., Cincinnati, O.
 Pischel, Kaspar.....1817 California St., San Francisco, Cal.
 Posey, Wm. C.....1835 Chestnut St., Philadelphia, Pa.
 Pond, G. P.....Pasadena, Cal.
 *Prince, Arthur E.....628 Capitol Ave., Springfield, Ill.
 Pyfer, Howard.....Norristown, Pa.
 *Pynchon, Edwin.....103 State St., Chicago, Ill.
 *Randall, B. Alexander.....1717 Locust St., Philadelphia, Pa.
 *Ray, J. M.....423 W. Chestnut St., Louisville, Ky.
 *Ray, Victor.....7th and Race Sts., Groton Bldg., Cincinnati, O.
 Reamer, Edwin F.....Mitchell, So. Dak.
 *Reber, Wendell.....1212 Spruce St., Philadelphia, Pa.
 *Reeve, A. R.....48 Bloor St., Toronto, Canada
 Reese, R. G.....147 W. 57th St., New York City
 Reger, H. S.....Ironton, O.
 Reik, Henry O.....412 Cathedral St., Baltimore, Md.
 Reiss, P. L.....Macheca Bldg., New Orleans, La.
 *Remmen, Nils.....103 State St., Chicago, Ill.
 *Renner, W. S.....361 Pearl St., Buffalo, N. Y.
 Reynolds, H. G.....15 S. 6th St., Paducah, Ky.
 *Reynolds, Dudley S.....315-16 Norton Bldg., Louisville, Ky.
 Rhodes, J. Neely.....1635 S. Broad St., Philadelphia, Pa.
 *Richardson, Chas. W.....1317 Connecticut Ave., N. W., Washington, D. C.
 *Rideout, W. J.....Freeport, Ill.
 Ringueberg, Eugene.....Lockport, N. Y.
 Ringle, Chas. A.....Greeley, Colo.
 Rinehart, H. D.....Dayton, O.
 Roberts, W. H.....461 E. Colorado St., Pasadena, Cal.
 *Roberts, Chas. M.....100 State St., Chicago, Ill.
 Rodman, Chas. S.....Waterbury, Conn.
 *Rogers, A. S.....105 S. Jefferson Ave., Saginaw, Mich.
 Rogers, Benj. F.....222 Franklin St., Buffalo, N. Y.
 *Rogers, W. K.....188 E. State St., Columbus, O.
 *Roller, Lewis A.....122 Monroe St., Grand Rapids, Mich.
 Roy, Dunbar.....Grand Opera House, Atlanta, Ga.
 Ruby, F. M.....Union City, Ind.
 Rust, E. G.....Lennox Bldg., Cleveland, O.
 Ryan, L. R.....Galesburg, Ill.
 Ryerson, G. Sterling.....6 College St., Toronto, Can.
 Samson, W. S.....122 E. Main St., Lancaster, O.
 *Sanders, A. F.....Groton Bldg., Cincinnati, O.
 Sanderson, H. H.....Washington Arcade, Detroit, Mich.
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 *Shurly, E. L.....32 W. Adams Ave., Detroit, Mich.
 Shute, D. K.....1719 De Sales St., Washington, D. C.
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 *Singleton, E. M.....Marshalltown, Ia.
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 Smith, J. F.....1700 California St., San Francisco, Cal.
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 Smith, S. MacCuen.....1429 Spruce St., Philadelphia, Pa.
 Snow, S. F.....713 University Blk., Syracuse, N. Y.
 Snyder, F. D.....Ashtabula, O.
 Snyder, Walter H.....211 Ontario St., Toledo, O.
 *Spalding, James A.....627 Congress St., Portland, Me.
 Spencer, F. R.....Boulder, Colo.
 Spohn, Geo. W.....Elkhart, Ind.
 *Standish, Myles.....6 St. James Ave., Boston, Mass.
 *Starkey, Horace M.....Rockford, Ill.
 Stanbery, Henry.....8-10 E. 8th St., Cincinnati, O.
 Starr, E. G.....523 Delaware Ave., Buffalo, N. Y.
 *Stein, Otto J.....100 State St., Chicago, Ill.

Stephens, F. M.	71 W. 49th St., New York City
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Stevenson, Mark D.	500-510 Everett Bldg., Akron, O.
Stewart, Chas. S.	Auburn, Ind.
Stieren, Edward	3603 5th Ave., Pittsburg, Pa.
Stiles, C. M.	1831 Chestnut St., Philadelphia, Pa.
*Stillson, Hamilton	Hinkley Bldg., Seattle, Wash.
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Sulzer, G. A.	986 Second St., Portsmouth, O.
Sutphen, T. Y.	999 Broad St., Newark, N. J.
Sweet, Wm. M.	1205 Spruce St., Philadelphia, Pa.
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Tenney, John A.	2 Commonwealth Ave., Boston, Mass.
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Thomson, J. J.	40 W. 47th St. New York City
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*Tuckerman, W. H.	1387 E. 105th St., Cleveland, O.
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Turner, Oliver W.	Augusta, Me.
Tydings, Oliver	103 State St., Chicago, Ill.
Upham, Helen Frances	305 3d Ave., Asbury Park, N. J.
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*Valk, Francis	164 E. 61st St., New York City, N. Y.
*Van Note, W. B.	Lima, O.
*Van Slyke, F. W.	204 Baltimore Blk., St. Paul, Minn.
Vaughan, G. E.	Clarksville, Tenn.
Veasey, C. A.	Traders' Bank Bldg., Spokane, Wash.
Vinsonhaler, Frank	Little Rock, Ark.
*Vittum, W. H.	688 Endicott Arcade, St. Paul, Minn.
von Colditz, G. Thompson	161 State St., Chicago, Ill.
*Voorhees, Sherman	408 N. Main St., Elmira, N. Y.
*Wadsworth, O. F.	526 Beason St., Boston, Mass.
Wagner, H. L.	2339 Bush St., San Francisco, Cal.
Wales, E. De W.	320 N. Meridian St., Indianapolis, Ind.
Warfield, Clarence	20 and 21 Hicks Bldg., San Antonio, Tex.
Waxham, F. E.	Denver, Colo.
*Webster, David	308 Madison Ave., N. Y. City
Webster, G. A.	410 Boylston St., Boston, Mass.
*Weeks, John E.	46 E. 57th St., N. Y. City, N. Y.
Wells, W. A.	The Rochambeau, Washington, D. C.
*Welsh, D. Emmet	53 Wonderly Bldg., Grand Rapids, Mich.
Welty, C. F.	Shreeve Bldg., San Francisco, Cal.
*Wescott, Cassius D.	31 Washington St., Chicago, Ill.
*Wheelock, K. K.	126 Harrison St., Ft. Wayne, Ind.
Wiener, Alfred	616 Madison Ave., N. Y. City, N. Y.
*Wilbur, E. P.	Kalamazoo, Mich.
*Wilder, W. H.	103 State St., Chicago, Ill.
*Willettts, Joseph	30 Westinghouse Bldg., Pittsburg, Pa.
*Williams, C.	136 W. 4th St., St. Paul, Minn.
Williams, W. C.	237 Wodner Bldg., Peoria, Ill.
Williamson, L.	Metropolitan Bldg., St. Louis, Mo.
*Willis, E. A.	The "Chalfant," Indianapolis, Ind.
Wishart, Chas. A.	913 Bessemer Bldg., Pittsburg, Pa.
*Wood, Casey A.	72 E. Madison Ave., Chicago, Ill.
Woodruff, Chas. E.	Fort Wadsworth, N. Y.
*Woodruff, Thos. A.	72 E. Madison St., Chicago, Ill.
Woodward, J. H.	58 W. 40th St., N. Y. City
*Woolen, Green V.	22 W. Ohio St., Indianapolis, Ind.
Wright, John Wesley	Columbus, O.
*Wurde mann, H. V.	411-14 White Bldg., Seattle, Wash.
Wyer, J. S.	Groton Bldg., Cincinnati, O.
*Yankauer, Sidney	616 Madison Ave., N. Y. City
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